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Chapter 1

ADMINISTRATION AND ASSISTANCE PROGRAMS

1.1 OVERVIEW

This annual report is a compilation of the happenings in various sections of the branch with some indications of the state of the Agriculture industry in Nova Scotia. There are also two more detailed technical reports that are available on the results of *Project Work* carried on by Branch members during the year. One is of projects in horticulture and the other deals in field crop topics. Copies can be obtained by contacting the Branch at its main offices in either Truro or Kentville.

It is hoped that the information contained within these reports find some use to those interested in the Agriculture Industry of Nova Scotia. We look forward to serving in 1992.

I would like to personally acknowledge and thank the many members of the Branch who worked so hard to make the transition to the combined Plant Industry go so smoothly and who made the production of this report possible.

J.B. Goit
Director

1.2 BRANCH ACTIVITIES

The Plant Industry Branch staff, Table 1.1, were active in a large number of meetings, committees, tours, publications, preparations and projects in 1991. A presentation of branch usage of vehicles during the year is found in Table 1.2.

1.3 ASSISTANCE POLICIES

1.3.1 FERTILIZER ASSISTANCE POLICY

The Fertiliser Assistance Policy was in full operation in 1991. A total of 1,691 applications were processed representing 1,590 individual claimants and $920,531.91 in assistance was paid out. Table 1.3 gives a summary of historic expenditures on the policy.

Table 1.1: Staff Of Plant Industry Branch, 1991

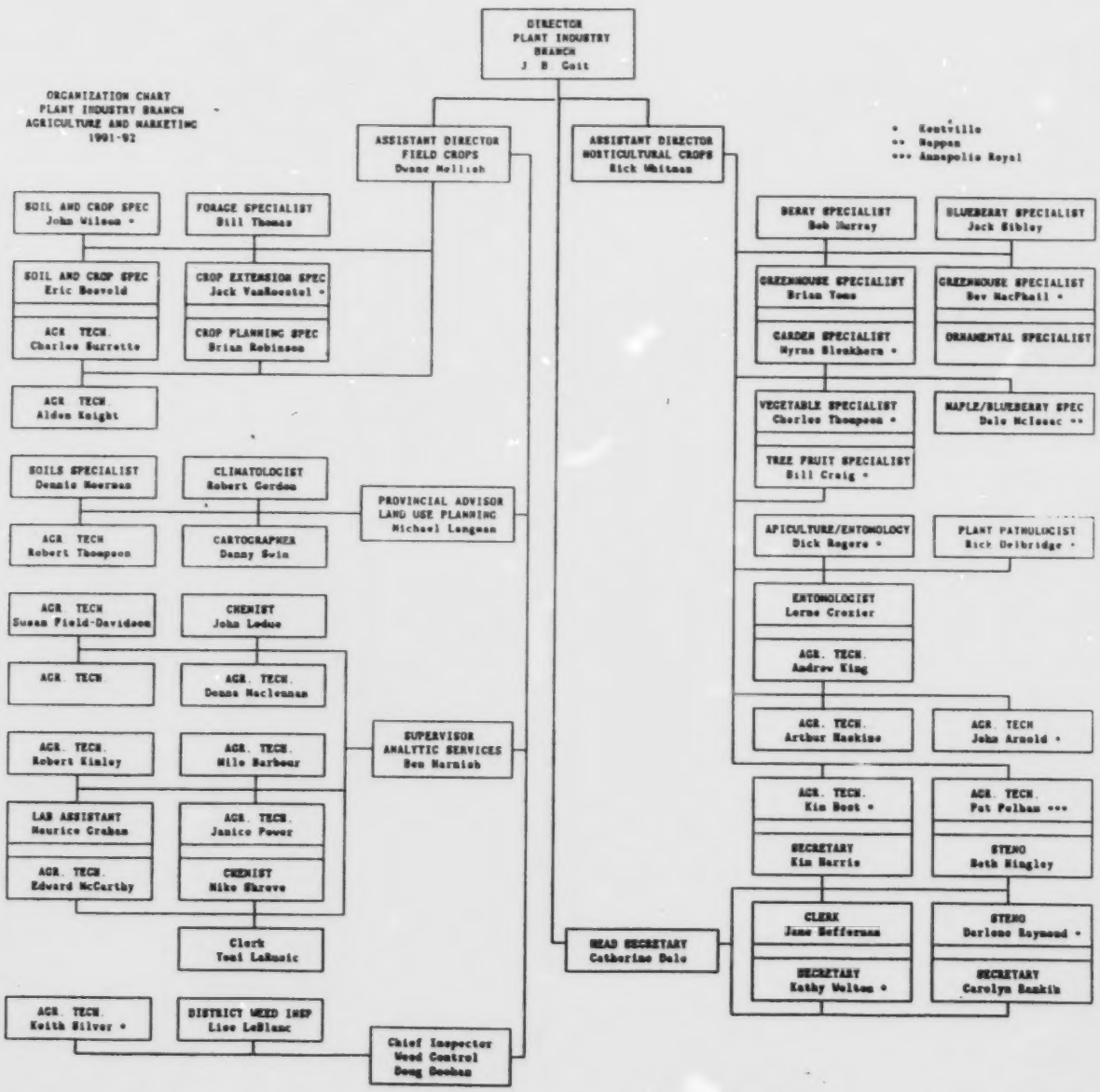
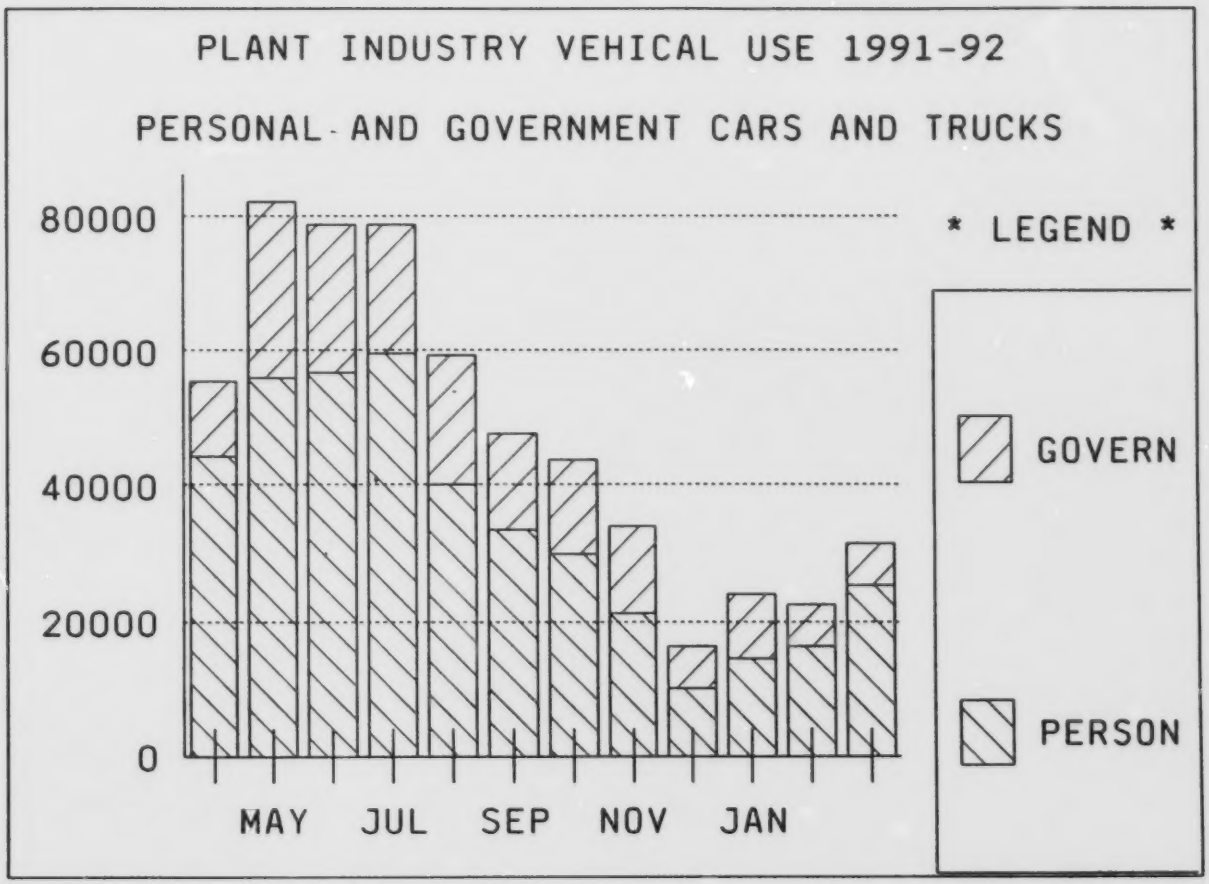


Table 1.2: Branch Vehicle Use



Claim size decreased in the 1991–92 year and the total program dollars were reduced. The funding formula was 20% of the first $2,000, an 10% of the remainder to a maximum payment of $2,000. This redusced the average size od payout per claim.

While most farmers made only one application some made more than one. Table 1.4 details this breakdown.

Table 1.5 shows the distribution of the size of claims made. More than 57% of claimants received less than $500 while 4% received the maximum grant of $2000.

Table 1.6 shows the breakdown of claims on a county basis. The larger agricultural counties such as Kings, Colchester, Hants and Cumberland received the most assistance.

Table 1.7 shows the area of crops on a county basis. It should be noted that *forage crops* represented almost 70% of the indicated hectares fertilized.

The total of 96,091 ha represented about 60% of what statistics would show as "improved farm land" in Nova Scotia. This compares to slightly over 100,000 ha indicated as fertilized in the previous year.

The most popular grade of fertilizer used in Nova Scotia during 1991 was 17-17-17. Over $2M was spent on this grade alone (almost 30% of total). As forage is the most widely fertilized crop it is not surprising that 17-17-17, 34-0-0, 12-24-24 and 18-6-18 are so widely used as they are common grass fertilizers in Nova Scotia. A summarization of the most common grades used is shown in Table 1.8.

Table 1.3: Historic Expenditures – Fertilizer Assistance Policy

Policy Year	No. of Applications	Average Application	Total Expenditure
1991–92	1590	$578.95	$920,531.90
1990–91	1623	$737.91	$1,203,810.90
1989–90	1806	$874.63	$1,579,589.90
1988–89	2075	$777.70	$1,613,697.99
1987–88	2079	$725.20	$1,507,681.94
1986–87	2075	$698.15	$1,448,659.61
1985–86	2251	$695.09	$1,564,666.79
1984–85	2387	$660.83	$1,575,398.26
1983–84	2430	$655.17	$1,592,070.65
1982–83	2481	$638.30	$1,583,628.30
1981–82	2471	$603.69	$1,499,952.27

Table 1.4: Number Of Fertilizer Applications Per Farmer

Number of Applications	Applicants
1	1590
2	98
3	3
Total	1691

Table 1.5: Breakdown Of Fertilizer Policy Claims by Amount

Claim Size Range	Number of Claims	Total $ Claimed
$2000	60	120,000.00
$1999–1750	20	37,211.64
$1749–1500	33	53,386.41
$1499–1250	49	67,032.02
$1249–1000	92	102,643.56
$999–750	183	120,167.84
$749–500	292	179,619.40
$499–250	458	171,969.40
$249–100	368	61,508.69
< $100	80	6,992.82
TOTAL	1590	920,531.90

Table 1.6: Fertilizer Assistance Policy 1990–91

County	No. of Claimants	Average $ Claim	Total $ Expenditure
Annapolis Co.	93	512.18	47,632.66
Antigonish Co.	110	669.12	73,603.51
Cape Breton Co.	52	491.60	25,563.26
Colchester Central.	79	649.92	51,344.06
Colchester North	22	391.56	8,614.41
Colchester South	78	725.87	56,617.83
Colchester West	24	659.43	15,826.40
Cumberland Co.	151	567.39	85,675.16
Digby Co.	11	241.17	2,652.84
Guysborough Co.	18	312.47	5,624.48
Hants East	59	790.38	46,632.53
Halifax Co.	54	624.29	33,711.84
Hants West.	141	523.34	73,791.50
Inverness Co.	74	498.38	36,879.80
Kings Co.	313	729.49	228,331.90
Lunenburg Co.	97	346.70	33,629.92
Pictou Co.	154	466.83	71,892.44
Queens Co.	6	346.86	2,081.13
Richmond Co.	3	293.13	879.40
Shelburne Co.	2	199.73	399.46
Victoria Co.	12	529.88	6,358.59
Yarmouth Co.	37	345.64	12,788.68
Total	1590	$578.95	$920,532.40

Table 1.7: Hectares of Fertilized Crop Per County - 1990-91

COUNTY	CORN	FORAGE	GRAIN	VEG	TREE FRUIT	SMALL FRUIT	OTHER
Annapolis Co.	308.7	3865.4	530.5	162.3	170.9	17.8	10.1
Antigonish Co.	.0	6338.1	505.5	.6	6.5	10.0	8.0
Cape Breton Co.	5.0	1696.2	180.7	190.2	.0	14.0	36.1
Colchester Central.	339.2	4411.7	361.9	65.2	.0	34.6	46.8
Colchester North	8.0	537.2	234.3	8.4	.0	.0	26.8
Colchester South	88.3	6056.2	154.5	8.6	.0	60.9	.0
Colchester West	38.0	502.3	343.6	197.0	.0	127.7	2.0
Cumberland Co.	46.0	6383.1	2178.1	273.5	.0	1507.1	54.0
Digby Co.	.0	236.1	40.1	14.2	10.0	9.0	.1
Guysborough Co.	.0	581.7	21.0	.0	.0	.0	.0
Hants East	156.1	4348.2	114.1	3.2	.0	4.0	992.5
Halifax Co.	21.3	3239.6	338.4	.0	.0	24.1	120.4
Hants West.	320.9	6285.2	797.7	75.2	69.3	114.8	48.0
Inverness Co.	.0	3737.4	202.6	3.4	.0	7.0	5.0
Kings Co.	1310.5	8433.3	4083.6	3972.0	3221.7	229.1	513.4
Lunenburg Co.	12.1	2855.6	179.1	45.3	20.2	57.2	1.0
Pictou Co.	103.9	7099.0	1458.2	65.3	1.6	115.3	16.0
Queens Co.	.0	218.1	28.0	.0	.0	.0	.0
Richmond Co.	.0	47.0	19.0	.0	.0	.0	.0
Shelburne Co.	.0	20.0	.0	1.0	.0	1.5	.0
Victoria Co.	.0	616.7	9.5	14.2	.0	.0	.0
Yarmouth Co.	.9	1163.4	.1	24.1	5.0	6.9	30.8
Total	2758.9	68671.5	11780.5	5123.7	3505.2	2341.0	1911.0
% Of Total Crop	2.9	71.5	12.3	5.3	3.6	2.4	2.0
% Of Total Group	3.3	82.5	14.2	46.7	32.0	21.3	100.0
Total Crop Fertilized	96091.8						
Total Field Crop	83210.9	86.6%					
Total Hort Crops	10969.9	11.4%					
Total Other Crops	1911.0	2.0%					

Table 1.8: Common Grades Of Fertilizer

GRADE	$ SPENT BY FARMERS	NUMBER OF CLAIMS
17-17-17	$2024142.00	1247
34-0-0	$946104.10	723
18-6-18	$621165.50	407
12-24-24	$763575.50	642
6-12-12	$61703.69	159
46-0-0	$163664.93	136
5-20-20	$103601.93	130
5-10-30	$86408.21	112
21-6-18	$237413.10	95
18-46-0	$95862.28	83
27.5-0-0	$75611.90	57
20-10-10	$42820.61	37
23-11-11	$61202.92	36
15-15-15	$62391.48	35
20-0-20	$41651.97	35
Total For All Types	$7040286.00	5852

1.3.2 BULK BIN CONSTRUCTION ASSISTANCE POLICY

By Myrna J. Blenkhorn, Horticulturist

The Bulk Bin Construction Assistance Policy is administered by the Plant Industry Branch. The assistance under the policy allows fruit and vegetable growers to construct up to 200 bins at $10.00 per bin – a maximum of $2000 assistance (minimum number of bins eligible is 25). The bins are inspected and coded — each farm having its own code.

The total money allocated under this policy is $85,000 of which $34,240 was spent this year. A total of 50 applications were processed of which 31 were tree fruits and 19 were vegetables. Only 39 growers submitted claims (22 tree fruit growers and 17 vegetable growers), 11 growers did not build bins. A total of 3424 bins were constructed.

Table 1.9: Bulk Bin Assistance – Breakdown by County

COUNTY	GROWERS	BINS	TREE FRUITS	VEGETABLE
Kings	30	2414	1628	786
Annapolis	1	200	200	
Hants	4	480	450	30
Colchester	3	130		130
Cape Breton	1	200		200
	39	3424	2278	1146

Chapter 2

FRUITS AND VEGETABLES

2.1 TREE FRUITS

By Bill Craig, Horticulturist

2.1.1 OVERVIEW

A relatively mild winter resulted in tree fruits overwintering well with no significant damage to trees or fruit buds. There appeared to be a good return bloom following a heavy crop in 1990. Frosts with lows of -3°C on May 19 and -2°C on May 23 being recorded at Kentville caused major damage to fruit buds and flowers, particularly in orchards located to the west of Kentville. The frosts were followed by below average rainfall in May and June and by two hail storms which contributed to reduced yields and fruit quality. The dry weather resulted in only 17 scab infection periods being recorded from May 1 to July 24 which reduced the number of fungicide applications. Heat units were up over the 30-year average and that recorded in 1990. Precipitation for the growing season was higher than average, however, there were periods of extended dry weather which did stress the trees. Fruit maturity and harvesting dates were similar to those of 1990 and advanced from average. Due to the smaller crop, harvest labour was not a problem and most producers had completed harvesting by the end of October.

The 1991 apple crop was estimated to be 1,680,000 bushels which would be down 53 per cent from the 1990 crop of 3,600,000 bushels. The pear crop was estimated at 30,000 bushels, down from the 1990 crop of 50,000 bushels. The farm gate value of the 1990 apple crop was $11,325,849 and that of pears $450,000. The total farm gate value of the 1990 tree fruit crop would be in excess of $11,775,849 and up over the 1989 value of $11,191,740.

There were major changes in the processing sectors with both juice plants and Sarsfield Foods Ltd. being sold. Cobi Foods Ltd. juice line was sold to A. Lassonde of Quebec, J.B. Food Industries to Sweet Ripe of Ontario and Sarsfields to Weston Bakery of Ontario. All three plants did process apples during the fall of 1991. Processing apple prices were up slightly over those of the previous seasons. In the new year juice apple prices rose from $4.50 per cwt to $8.50 per cwt. A small volume of juice apples were sent to the US because of higher returns. Fresh fruit prices in the fall and new year were up $3.00 to $4.00 per carton over the previous years due to the smaller crop. Even though the Gravenstein crop was reduced by the frost, the NSFGA were able to ship 3,466 cartons to the Toronto market. This was a slight increase over the 2,400 cartons shipped in the fall of 1990.

Approximately 3,500 bulk bins were built under the Bulk Bin Construction Policy. A total of 6 C.A. operators and packers of C.A. apples were certified under the C.A. Storage Operator and Packer Regulations. A total of 143 apple producers were enrolled in the Apple Tripartite Stabilization Program for 1991. A premium of $6.50 per tonne was collected on approximately 33,597,184.62 kgs of apples. There was no stablisation payout on the 1990 crop. The Nova Scotia Crop and Livestock Insurance Commission will pay out approximately $1,000,000 on claims for loss of production and quality of apples and pears. There were no claim payments

in 1990. To date 53 producers have received approval for assistance on one to two acres of high density orchard under the NSFGA Assistance Program.

2.1.2 GROWING SEASON

Climatic conditions during the winter months were normal and no significant winter injury problems to fruit trees were observed in 1991. Mean monthly temperatures for December 1990, February and March 1991 were slightly higher than the 30-year averages. The mean of -6.8°C for January was slightly below the 30-year average of -5.0°C but well below the previous January mean of -1.8°C. The minimum temperature recorded during this period was -21°C on January 8 which compares to the previous season's low of -23.5°C on February 27. The 30-year extreme minimum for this period is -31.1°C. Temperature fluctuations were not extreme with highs of 8.5°C, 9.0°C and 15°C being recorded during January, February and March.

Snowfall total for the period of January 1 to April 30 was 161.6 cm, which was slightly higher than the 147.8 cm recorded for the same period in 1990 but below the 30 year average of 201.3 cm. The greatest depth of snow on the ground, 35 cm, was recorded on March 25. The ground was snow covered for the months of January and February but fluctuated between 0 and 35 cm during March. After April 3 there was no snow on the ground.

The mean temperature for April 5.3°C was higher than the 30 year average 4.4°C, but below that recorded for the previous April 6.1°C. The early disappearance of ground snow and slight warmer temperatures advanced fruit bud development. The green tip stage of apple bud development was first observed on April 22 which is considered early and was not observed until April 28 in 1990. Temperatures during May were also warmer than normal with a mean of 12.1°C which compares to a 30-year mean of 10.4°C and the 1990 mean of 9.4°C. Warm temperatures sped up fruit bud development with early bloom of apples being observed on May 20th. Two late spring frosts were recorded with a low of -3°C on May 19 and -2°C on May 23 at Kentville.

These temperatures are considered abnormal for this time of year. These lows were combined with several hours of below freezing temperatures. At Kentville the temperature dropped below the freezing point around midnight of May 18 and remained below the freezing point until 6 am on the 19th. On the 23rd the temperature dropped below the freezing point around 3 am and remained below 0°C until 7 am. The frost on the 19th was an advective freeze while that on the 23rd a radiation freeze. Both of those frosts caused damage to fruit buds. The extent of fruit bud damage varied with orchard location and between cultivars. Orchards to the west of Kentville sustained more damage than those to the east due to the moderating effects of the Minas Basin on air temperature. Orchards located on the floor of the Valley or in frost pockets sustained the most damage. Cultivars with early flower bud development such as Gravenstein sustained more damage than the late maturing cultivars such as Northern Spy. The frost damage appeared as blackened flower parts, pistils and/or ovaries. In some cases the whole flower was blackened. In one orchard damage to the fruit spur of Gravenstein was observed. The frost did also cause fruit russetting but it was not as severe as that observed in 1986 on apples.

Precipitation for the month of May totalled 128.4 mm which was higher than the 30-year average of 75. mm but well below the 198.4 mm recorded in 1990. The bloom period for all tree fruits was warm and relatively dry which was conducive to pollination of viable flowers.

Mean temperatures for June, July, August and September were normal to slightly above normal and similar to those of 1990. A total of 417.4 mm of rain was recorded for this period which compares to a 30-year average of 325.0 mm. Total rainfall figures are misleading as periods of draught did occur during June and July. During June a total rainfall of 14.8 mm was recorded while the evaporation total was 177.4. Total rainfall for July was about normal, however, two rains accounted for 70 per cent of the total precipitation. Although the evaporation rainfall deficit was higher in 1990 than in 1991, the prolonged intervals between rain fall was more of a concern to growers than dry weather in the later part of the 1990 growing season.

Degree days above 5°C from May 1 to September 30 totalled 1,799.3, which is above the 30-year average of 1,629.4 and 1990's total of 1751.5. Hours of sunshine recorded for this period was 1,166.6 hrs which is above the 30-year average of 1,017.9 hrs.

A total of 17 apple scab infection periods was recorded between May 1 and July 24 which were 3 more than that recorded the previous year but is considered low. Only 3 infection periods were recorded during

May compared to 7 in June. The extended dry periods during May and June resulted in most growers reducing the number of fungicide applications. Some producers were able to obtain adequate scab control with only 8 fungicide applications. Scab infections that were observed resulted in many cases from the two prolonged wetting periods of 15.5 and 48 hrs which occurred in May. Captan remains the most commonly used fungicide as the EBDC registration problem in the USA was not resolved in 1991. Once again the incidence of sooty mold and fly speck was higher as captan is not as effective as the EBDC fungicides in controlling these pathogens. The reported and observed incidence of powdery mildew and fireblight was not up in 1991.

What appeared to be a good to excellent return bloom in most orchards was adversly affected by the two frosts and thus fruit set was light in orchards to the west of Kentville. The use of chemical thinners was minimal due to the light fruit set in many orchards and the concern of overthinning frost damaged trees. There was also a concern about a potential heavy July drop due to the frost damage and dry weather in June, however, this did not occur. Apples developed at a good date due to warm weather, timely rains and lighter crop loads. Nutritional disorders such as bitter pit and corky core induced by dry soil conditions were more apparent than reduced fruit size from the lack of rain in June and July. The reduced crop load in many orchards and timely rains appeared to have prevented any major moisture stress problems. The early bloom dates and above-average temperatures advanced fruit maturity. Ethrel treated Gravensteins were being harvested by August 23rd with non-treated fruit being harvested by August 30. Maturity testing of McIntosh indicated that spot picking for C.A. cold storage could have begun by September 18 which is considered an early starting date but was similar to that of last year. Fruit color was exceptional in most orchards and developed early.

The mean temperatures for September 14.7°C and October 10.7°C were similar to the 30-year averages of 14.3°C and 9.1°C. Precipitation for these two months was 152.6 mm and 104.6 mm, well above the 30-year average of 85.5 mm for both months. At the start of the McIntosh harvest season, there was a concern about a possible premature drop problem as the fruit was picking easy. As the harvest season progressed, the fruit tightened up and a serious premature drop problem did not occur. The heavy rains during September likely alleviated any moisture stress problems on the trees and prevented this problem. Due to the short crop and high unemployment, harvest labour was not a problem. The first fall frost was not recorded until October 21 with only two frosts being recorded in October. The first hard frost of -6°C was not recorded until November 30th at Kentville. The harvesting of fruit and fruit quality was not adversely affected by fall frosts. The above average rainfall did however, cause mobility problems in orchards and most orchards were badly rutted by the end of the harvest season. Most producers had completed the picking of apples by the last week of October, however, the picking up of drop apples continued well into November.

2.1.3 PRODUCTION AND MARKETS

The preliminary estimate for the 1991 apple crop was set at 1,680,000 bushels which is 53.3 per cent lower than the 1990 crop of 3,600,000 bushels and 46.5 per cent lower than the 5-year average of 3,400,000 bushels. All cultivars experienced a decline in yield with Gravenstein accounting for the greatest decline at 69.2 per cent. The 1990 apple crop which was originally estimated at 3,300,000 bushels was raised to 3,600,000 bushels based upon processing and certified apple sale figures. The final crop figure for 1990 made it the second largest apple crop produced since 1949. The Canadian apple crop estimate as of October 31, 1991 was 26,467,000 bushels, down 7 per cent from 1990's crop of 28,331,000 bushels.

The USDA October estimate placed the 1991 US apple crop at 241,131,000 bushels which is 4 per cent higher than 1990's crop of 230,876,000 bushels and 7 per cent higher than the 5-year average. The eastern and central regions were up by 21 and 13 per cent while the west was down by 4 per cent in 1991.

The December 1st storage holdings for Nova Scotia apples were 742,285 bushels which is 25 per cent lower than 1990 December 1st holdings of 1,000,000 bushels. As of December 1, 1991 there were 441,548 bushels in C.A. storage and 300,733 bushels in cold storage. These compare to the 1990 holdings of 429,333 for C.A. and 560,666 for cold storage. The increase in C.A. storage is accounted for by the construction of two new C.A. storages in 1991. Seventy-five per cent of the apples in storage are for fresh fruit sales.

The short apple crop did result in a good demand and strengthened returns during the fall of 1991. Packers

have been able to maintain a strong price throughout the fall and into the new year. The October 30th Halifax wholesale paying price for 12x3, 8x5 cello bags of Cortland, McIntosh and Red Delicious was $14.00 – $17.00 which compares to 1990 prices of $10.50 and $13.50. There was concern about the availability of Gravensteins for the Toronto market. The industry had planned to expand this market following last year's introduction of Gravensteins to this market. In 1990 2,400 bushels were sold through 20 stores and this was increased to 3,466 boxes in 1991. Although large volumes of Gravensteins have not moved to the Toronto area, the industry is still planning to develop this market for additional Gravenstein sales.

The export of fresh fruit apples continued its decline with only 47,302 bushels being exported from the 1990 crop. The export volume for 1989 was 75,426 and 98,076 bushels for 1988. The reduced crop in 1991 will result in even fewer fresh fruit exports.

The 1990 Nova Scotia Apple Enterprise Study reported a net return of 28 cents per bushel. This is only the third time in the past ten years that a positive return has been reported. The average return for fresh fruit was $4.72 per bushel, peeler apples $3.09 per bushel and juice apples $1.81 per bushel. The overall return for apples was $3.80 per bushel which is up over the 1989 average of $3.29 per bushel and was the second highest return during the past ten years. The cost of producing a bushel of apples was $3.56 per bushel and well below the 10-year average of $4.02 per bushel. The average yield per bearing acre was 477.8 bushels which is the second highest during the past 10 years and is only surpassed by the 1988 average of 516 bushels. Barring natural disasters average yields have been gradually increasing during the 1980's and this increase would be attributed to orchard removal and improved production techniques.

2.1.4 PROCESSING

A total of 2,517,886 bushels representing 69.9 per cent of the 1990 apple crop was processed. This compares to the 1989 figure of 1,732,570 bushels and 64 per cent of the crop. The bulk of the processing apples representing nearly 47 per cent of the total production went for juice production. The farm gate value for 1990 processing apples was $6,488,800, up 119 per cent over the 1989 value of $2,963,500. The increase in value was due to slightly higher prices and the increased volume processed.

Major changes occurred in the apple processing during 1991. Sarsfield Foods Ltd. was purchased by Weston Bakeries of Ontario. Management was retained and Sarsfield Foods is undergoing another expansion phase. Cobi Foods Ltd. sold their juice lines to A. Lassonde and Fils Inc. of Rougemont Quebec, while retaining their peeler lines. The Kentville and Coldbrook facilities were also sold to A. Lassonde. Cobi Foods also sold their orchard division to the Stirling family. J.B. Food Industries Inc. sold Allens Food Products to Sweet Ripe, an Ontario based processing firm. The changes in the processing sector are a sign of troubled times in the Canadian food processing sector and time will tell if the Nova Scotia processing sector was strengthened by these changes.

Although production of apples was down significantly, processing prices only rose slightly over those offered in 1990. The price of juice apples at the start of the harvest season was $4.50 per cwt for Gravenstein and $5.00 per cwt for hard apples which compare to the 1990 price of $3.75 and $4.25 per cwt. A strong US juice price rose the later part of 1991 resulting in juice prices increasing to $8.50 per cwt in early January 1992. The increase in US prices was due to a short crop in Europe which pushed concentrate prices up.

The price for peelers rose slightly with the greatest increase occurring for Spys. Growers received $12.00 per cwt for Spy compared to $10.00 per cwt in 1990. Cortland, King and Greening returned $7.00 per cwt. The price for these two groups of cultivars was $6.00 and $6.50 per cwt in 1990. Two dollars per cwt was deducted from Spy that were bruised by hail or high winds. There was some movement of processing apples to the US due to previous commitments and as a result of higher returns being offered. Some Spy peeler apples were brought into Nova Scotia from Ontario to supply Sarsfield Foods Ltd.

2.1.5 PEAR AND STONE FRUIT

The 1991 pear crop was estimated to be 30,000 bushels which would be down by 20,000 bushels from the 1990 crop of 50,000 bushels. The two May frosts caused significant blossom damage resulting in loss of production and fruit quality. In most orchards that did set fruit, the pears were heavily frost russeted. The russeting

usually appeared as a band around the middle of the pear. The russeting affected the development of the pear and misshapened pears were a common sight in these orchards. In some cases producers did not harvest a significant portion of the pear crop due to the russeting. A warm dry growing season resulted in soluble solid levels of 9-10 Clapp's Favorite and 10-11.5 for Bartlett. Pressure testing of Clapp's Favorite and Bartlett pears indicated that harvesting could have begun on August 23rd for Clapp's Favorite and September 5 for Bartlett. These dates were similar to those for the past two growing seasons and are considered at the early end of the harvest season. No major disease problems were observed or reported. Pear psylla populations were higher due to the warm dry growing season and reduced number of mancoseb sprays for pear scab.

The bulk of the 1991 pear crop was sold within the Altantic region. The reduced pear crop resulted in a good demand and higher returns. The October 11, wholesale to retail quotations for Clapp's Favorite and Bartlett 4x4 L was $13.00–$16.70. This compares to the 1990 quote of $10.03–$10.69 for 4x4 L. A small volume of pears was shipped to Allen's Food for juice to be used in the Gravenstein/pear drink. The average farm gate return for the 1990 pear crop was $9.00 per bushel. The farm gate value for the 1990 pear crop was $450,000.

The stone fruit crop was past the blossom stage when the two frosts occurred. Damage to the set fruit was observed, however, yields of stone fruit were better than expected. Stone fruit are more sensitive to low temperature at post bloom than apples during the bloom period. The Japanese plum production was off due to the frost damage and was in short supply at harvest time. European plum which are hardier than Japanese also were off but yields were higher than anticipated. Sweet cherry were in short supply while peach production was very good in most orchards. The stone fruits overwintered very well and excellent bloom was observed. A heavy set occurred in most blocks and in the case of peach, the frost acted as a thinner leaving sufficient fruit for a good crop. Due to the size of the plum industry in Nova Scotia, Statistics Canada decided to drop plums from their yearly records. Therefore yield and value figures for Nova Scotia plums will no longer be available.

2.1.6 INNOVATIVE DEMONSTRATIONS

Demonstration Orchard - Scab Resistant Cultivars

General horticultural maintenance was carried out on the eleven scab resistant cultivars. Frost damage to fruit buds resulted in light yields with available apples being utilized for a storage study. Trunk cross section measurements and yield per tree were recorded.

Orchard System Trial

Trunk cross section measurements and yields were recorded for McIntosh and yields were recorded for McIntosh and Idared trees in a commercial orchard systems trial. Tatura V Trellis, Vertical Axis and a free standing High Density training system are being compared with the 155 System.

Pear Rootstock Trial

Trunk cross section measurements and tree survival numbers were recorded for pear trees located on three farms. The trial was set out in 1989 to compare three cultivars - Clapp's Favorite, Swiss Bartlett and Conference on four rootstocks: Quince A, OHXF 69, OHXF 87 and OHXF 333. This is a joint project involving the NSFGA, Agriculture Canada and NSDA&M.

Apple Rootstock Trial

An apple rootstock trial was set out on six grower sites and at the Kentville Agricultural Centre. The trial will compare seven rootstocks: Mac 1, M 4, M 7, M 26, KSC-28, MM 106, Bud 490 and self-rooted Macspur, grafted to the cultivar Macspur McIntosh. This is a joint project involving the NSFGA, Agriculture Canada and NSDA&M. Trunk cross sectional measurements and tree survival numbers were recorded for each planting in the spring of 1991.

Apple Cultivar Evaluation Trial

Routine nursery maintenance was carried out on the six Jonagold strains, eight McIntosh strains, Jonamac and Jersymac grafted on M 9 EMLA for planting in 1992. Three hundred M 9 EMLA rootstock were set out and budded to 30 selections for planting in 1993.

C.A. STORAGE OPERATOR AND PACKER REGULATIONS

In 1991 six cold storage firms applied for and were issued Certificates of Registration as Controlled Atmosphere Storage Plant Operator. Six fruit farms were granted Certificates of Registration of Packer of Controlled Atmosphere Stored Apples. Gas levels in the registered C.A. storages were routinely monitored by David Bowlby, the NSFGA Apple Inspector.

2.1.7 APPLE TRIPARTITE STABILIZATION PROGRAM

Grower enrollment remained at 143 NS apple producers for the 1991 crop. The 1991 premium rate increased by 25 cents per tonne to $6.50 per tonne as a result of the higher average aggregate market value for apples. It is projected that NS producers will register 33,597,184.62 kgs of apples for 1991, down significantly from the 52,640,000 kgs registered in 1990. There was no payout on the 1990 apple crop.

I attended a signatories meeting in Ottawa on May 28 to discuss and finalize Amending Agreement #3. The signatories agreed to sign Amending Agreement #3 thereby allowing the NTSA program to function for the 1991 crop year. The signatories are concerned about the slow progress in establishing a level playing field for government assistance as outlined in the original agreement. British Columbia assistance level appears to be out of proportion with the other four provinces. If a concrete plan for establishing a level playing field is not put forth by next July, there is concern that Ontario will withdraw from the program.

A National Tripartite Stabilistion Committee for Apple Meeting was held following the signatories meeting. The Committee agreed to a slight change in the definition of a producer for enrollment purposes. The premium rate was established and the 1990 market price for apples was projected to be $235.4 per tonne. The support price for 1990 was $230.13 per tonne and therefore a payout would not occur. The forecasted deficit position at the end of the 1990 crop year was $1.8 million. The committee agreed to drop the 125which allowed producers to register all of their apple production even though they had underestimated their crop in August.

2.1.8 CROP INSURANCE

The Crop and Livestock Insurance Commission will be paying out approximately one million dollars to approximately 70 apple and pear producers for loss of production and fruit quality, on the 1991 crop. The May frosts resulted in reduced yields and quality due to russeting. Two hail storms reduced quality of apples in the Morristown and Woodville areas. There were no claims for apples and pears in 1990. The last major frost damage which occurred in 1986 resulted in $800,000 being paid out to 40 claimants.

2.1.9 EXTENSION

A tree fruit production short course was held at the Kentville Agricultural Centre, February 12-14th. Thirty-four growers from Nova Scotia, New Brunswick and Prince Edward Island attended the three-day course which dealt with various aspects of high density orchard production.

An evening short course on tree fruit production was held in Bridgewater on April 4 and 11 with 35 home gardeners attending.

One lecture was given to Dr. Ju's NSAC technician class on the Nova Scotia tree fruit industry and this was followed up with a pruning lab session held in Kentville on March 21.

Two half-day pruning workshops were held in conjunction with the NSFGA Pruning Committee. The first workshop was held at George Foote's on March 27 with light grower attendance and the second at Peter

VanOostrum's on April 3rd with excellent grower attendance. A pruning session was held at Bob Barteaux's in Annapolis Co. to demonstrate and discuss pruning of young trees.

Two twilight meetings were held during the year. One was held at the Woodville Community Centre on June 6 where Dr. Chick Forshey, a retired research pomologist from Hudson Valley, New York, spoke on chemical fruit thinning and fruit production in the state of New York. The other meeting was held at Jeff Allen's high density orchard planting in Billtown on June 19 to discuss the training of young apple trees.

Orchard walks were held at Peter Elderkin's on June 6 and Doug Nichols' on June 7 with Chick Forshey and local growers to discuss chemical thinning of apples.

Grower consultations were held during the months of February, March and April to draw up spray and fertilizer recommendations for the 1991 growing season. Approximately 35 spray consultations were held which compares to 15 in 1990. Additional fertilizer consultations by phone and office were held to discuss soil and foliar analysis reports. Thirty plus office and phone consultations were held to draw up plans for high density orchard plantings.

Orchard visits were made throughout the growing season with the majority of visits being made within the Annapolis Valley. One trip was made to Shelburne in July and one to Yarmouth in November to meet with growers in these areas. The majority of orchard visits were related to horticultural problems such as pruning, frost damage, fruit set, hail damage, disease and insect problems.

Twenty-one issues of the Orchard Outlook were published. Joint meetings with Federal research staff, APM and provincial staff were held Wednesday mornings during the months of May, June and July prior to writing the Orchard Outlook. The Orchard Outlook highlights were broadcast each Thursday on AVR's Farm and Resource Program.

Three trips were made out of province. I attended the 34th Annual Conference of the International Dwarf Fruit Tree Association with Cameron Spurr. The Conference was held in Grand Rapids, Michigan from February 24–27. The conference consisted of two days of technical talks on various aspects of fruit production on size controlling rootstock and one day of touring high density orchard plantings. Growers, researchers and extension personnel from across North America were in attendance. On May 28 and 29 I attended Apple Tripartite Stabilization related meetings in Ottawa. I participated in the Ontario tree fruit nursery tour from August 19 to 22. Peter VanOostrum, Jeff Allen and myself visited six nurseries in Southern Ontario to determine tree availability and quality for future Nova Scotia high density orchards.

I was involved with the NSFGA High Density Orchard Assistance Program. I assisted growers with orchard design, checked orchard sites as to their suitability and sat on the High Density Orchard Committee which reviewed applications for assistance. The High Density Orchard Assistance Program was introduced in January 1991. To date 63 applications had been received and tentative approval has been given to 50 producers for assistance. Of the original $300,000 placed into the plan, $287,921 had been committed by December. The majority of applicants indicated that planting would not occur until the spring of 1992. Nine applicants were able to plant all or a portion of the trees applied for in the spring of 1991. Due to a shortage of quality nursery trees, the Program is being extended into 1993.

Services provided to fruit growers during the past year were: 1) Orchard site evaluation - 4 orchard sites were evaluated with the assistance of Dennis Moerman as to their suitability for orchard. 2) Soil fumigator - thirteen growers and two government agencies fumigated 18.4 hectares. 3) Apple replant test - five growers, had nine soil samples tested for a potential replant problem. 4) Soil and foliage analysis - 70 growers requested this service with 411 leaf and 371 soil samples being collected between July 22 and August 9. This compares to 1990 totals of 82 growers, 499 leaf and 485 soil samples.

I assisted one producer in applying for AFDA funding under the Technology Introduction & Evaluation Program - Dwarf Cherry Rootstock Trial - Chipman Farms Ltd. and the NSFGA with two AFDA Human Resource Development Program applications. 1) Ontario Tree Fruit Nursery Tour, 2) Guest Speakers NSFGA 128th Annual Meeting. I also served as project leader on the following projects: 1) Evaluation of Scab Resistant Cultivars on Bud 490 Rootstock, Ebbis Peill, 2) Evaluation of Air Curtain Orchard Sprayer, Peter VanOostrum, 3) Commercial Evaluation of New Apple Cultivars, Gilbert Allen and 4) Apple Rootstock, Cultivar & Training System Evaluation, Peter VanOostrum.

I served on the following NSFGA committees - Future Orchards; Maturity and Storage; Pruning; Summer

Orchard Tour; Human Resource; Annual Meeting and High Density Orchard. I also served on the Provincial Farm Weather Service Committee, the Nova Scotia Tree Fruit Research Foundation and the National Tripartite Stabilization Committee for Apples. I continued to serve as the editor for horticultural publications put out by the Atlantic Advisory Committee on Tree Fruits.

Table 2.1: Final Disposition of 1990 Tree Fruit Crops

	BUSHELS	FARM GATE VALUE
PRODUCTION	3,600,000	$11,325,849
FRESH FRUIT SALES		
DOMESTIC - CERTIFIED	332,163	
DOMESTIC - UNCERTIFIED	702,649	
EXPORTED	47,302	
TOTAL	1,082,114	$ 4,837,050
PROCESSED	2,517,886	$ 6,488,800
PEARS	50,000	$ 450,000
PLUMS	N/A	N/A

2.1.10 APPLE MAGGOT CONTROL BOARD

By Myrna J. Blenkhorn, Horticulturist

The Apple Maggot Control Board met twice in 1991 (April & November). Routine business was carried out at both meetings such as manpower commitments for the Fall Survey, apple maggot infestations and dealing with the results of the Fall Survey. The present board membership consists of Gerard Killam, Chairman; Myrna Blenkhorn, Secretary; Larry Neily; Harold Forsyth; Philip Daniels; Bryan Woodland; Jim Goit and Greg Cunningham (acting). Dr. Rick Whitman, Dick Rogers and Dr. Robert Smith serve as technical advisors. Greg Cunningham is acting as the Agriculture Canada, Plant Health representative replacing Wanda Alexander.

No tree removals were done in 1991 by the Apple Maggot Control Board. However, a number of older blocks were removed by the growers as newer blocks start to produce. People are interested in having removal work done but want the wood saved so are not interested in having a bulldoser do the work.

The Annual Fall Survey was carried out in cooperation with the Food Production and Inspection Branch of Agriculture Canada during August and September. The survey took 6 weeks to complete (one extra week to cover strike by PSAC employees) with 11 inspectors, 7 inspectors were employed by the Board and 4 inspectors were employed by Agriculture Canada. During this time 1017 inspections were completed: 626 commercial blocks and 391 contacts. The infestation rate of commercial blocks was 43.4% up considerably from 1990 (34.6%). Infestation in contact orchards was 62.7% which was also higher than 1990 (56.2%).

The increase in apple maggot infestation this year means this is the third year with a considerable increase - 1988 rate was 18.7% and now in 1991 the rate is 43.4%. Concern has been expressed by the Board and by growers over the amount of apple maggot infestations found this year. A number of questions have been raised such as are spray materials being used, and are they effective or is there some resistance, is this a temporary problem, is monitoring being done properly. One concern of the Board's is whether the growers have been lulled into a false sense of security because of the low amounts of infestations found in the 80's and maybe sprays are not being applied.

Table 2.2: 1991 N.S. Tree Fruit Crop Estimates

	1990 BUSHELS	1991* BUSHELS	% CHANGE FROM 1990	5-YEAR AVERAGE
APPLES	3,600,000	1,680,000	-53.3	3,140,000
Gravenstein	260,000	80,000	-69.2	222,000
McIntosh	1,350,000	600,000	-55.5	1,110,000
Cortland	450,000	200,000	-55.5	378,000
Red Delicious	280,000	150,000	-46.4	290,000
Spy	320,000	200,00	-37.5	284,000
Spartan	50,000	30,000	-40.0	N/A
Idared	90,000	70,000	-22.2	N/A
Other	800,000	350,000	-56.3	N/A
PEARS	50,000	30,000	-40.0	N/A

* Estimate yield as of September 1991

The whole issue of sprays and IPM for apple maggot will be looked at by the IPM Committee of the Fruit Growers Association.

The increase in apple maggot infestation in the past few years may be a reflection of the condition of the state of the industry-low price, high cost of inputs and then this year the Valley was hit by damaging frosts which reduced the size of the crop dramatically in some areas. In a number of cases the apple maggot has slowly been increasing over a number of years and gained a foothold in the orchards without the grower noticing or controlling the situation.

Growers had ideal conditions for controlling the apple maggot but these conditions also benefit the apple maggot and in some cases the flies are working well into September. The amount of frost damage in some blocks may have reduced the crop to the point that the grower may have stopped applying pesticides.

The orchard registration forms and official spray orders were mailed out in the spring and the end of June (for the spray orders). Our records are kept up-to-date through these mailings and the fall survey. Some of the information on tree removals by growers is obtained from personal observations and the Land Improvement Policy.

A new publication — "Apple Maggot Control in the Home Garden" was prepared for backyard gardeners. This publication included controls such as sprays and the use of baited traps as a control method. A display about the Apple Maggot was set up in the Fruit Growers Museum for the summer.

The IPM Committee of the N.S. Fruit Growers Association coordinated the ordering and distribution of the new apple maggot traps. The traps were promoted to gardeners as a means of control without using sprays. The first year of using the traps was considered to be successful and will be carried out again.

A report of the Board's activities for the year is required for the Nova Scotia Fruit Grower's Association. A copy of that report is attached as well as a breakdown of infestation by zones for the last 3 years.

Table 2.3: Canadian and USA Apple Production

	1990 (BU)	1991 (BU)	% CHANGE
CANADA	28,330,571	27,615,143	-3
NOVA SCOTIA	3,600,000	1,680,000	-53
NEW BRUNSWICK	415,000	368,000	-11
QUEBEC	4,811,000	5,532,667	+15
ONTARIO	10,249,857	12,167,952	+19
BRITISH COLUMBIA	9,254,714	7,866,524	-15
UNITED STATES	230,876,000	241,131,000	+4
EASTERN	59,510,000	71,714,000	+21
CENTRAL	27,213,000	30,833,000	+13
WESTERN	144,162,000	138,584,000	-4

2.2 BERRY CROPS — EXCLUSIVE OF LOWBUSH BLUEBERRY

By Robert A. Murray, Senior Horticulturist
Andrew King, Technician
John Arnold, Technician

2.2.1 OVERVIEW

The 1991 berry crop grossed Nova Scotia growers $5,755,659 (Table 2.4). This is a decrease of $462,826 over 1990 farm value. Lower production in strawberry and highbush blueberry fruit and in strawberry nursery plant sales contributed to the decrease. Strawberry fruit production was down by one million quarts because of spring frosts and summer drought. Strawberry nursery sales were down on account of reduced plant sales in Florida. Production of cranberries, raspberries and grape showed a slight increase.

Table 2.4: Berry Crop Production And Value — 1991

FRUIT	PRODUCTION	UNITS	PRICE	VALUE ($)
Strawberry	3,000,000	quarts	1.10	3,300,000
Highbush Blueberry	250,000	pints	1.40	350,000
Cranberry	500,000	pounds	0.70	350,000
Raspberry	175,000	pints	1.30	227,500
Grape	183	tons	650.00	118,950
Strawberry Nursery Plants	20,214,205	plants	0.064	1,293,709
Raspberry Nursery Canes	350,000	canes	0.33	115,500
TOTAL				5,755,659

2.2.2 STRAWBERRY

The Nova Scotia strawberry industry in 1991 recorded a farm gate value of $4,593,709, down $538,776 from 1990 (Table 2.5). Fruit production was down one million quarts from an average crop, however fruit prices were up about 18 cents a quart because of the smaller crop. Strawberry certified plant sales were down 5.4 million plants, mainly because of reduced sales to growers in Florida (Table 2.6).

Fruit Production

Nova Scotia's strawberry crop is estimated at 3 million quarts, down 800,000 quarts from 1990 crop, and down one million quarts from normal production from a steady 700 producing acres.

Severe frost conditions during May and early June along with drought conditions from June to late July reduced yields. Lower yields created greater stability in the market. Growers estimate their 1991 crop loss may exceed one million dollars.

The 1991 production questionnaire indicated yields per acre ranged from 100 quarts per acre to 11,000 quarts per acre. Some growers with irrigation and ample water supply did record good yields. Other growers who did have irrigation still had reduced yields due to other causes.

Nova Scotia strawberry growers planted 339 acres in 1989, 350 acres in 1990, and 454 acres in 1991. There could be 850 acres in production in 1992 (Table 2.8) (Graph 1).

Table 2.5: Total $ Value — Nova Scotia Strawberry Industry

YEAR	$,000 FRUIT SALES	$ PLANT SALES	$ TOTAL
1980	1,827	302,104	2,129,104
1981	1,988	455,666	2,443,666
1982	3,160	520,768	3,680,768
1983	3,397	831,534	4,228,534
1984	3,720	931,222	4,651,222
1985	3,520	871,058	4,391,058
1986	3,419	912,934	4,332,434
1987	3,867	1,175,259	5,042,759
1988	4,376	1,306,195	5,682,195
1989	4,000	1,416,015	5,416,015
1990	3,492	1,640,485	5,132,485
1991	3,300	1,293,709	4,593,709

Table 2.6: Nova Scotia Strawberry Nursery Sales

YEAR	TO NOVA SCOTIA GROWERS (PLANTS)	ACRE EQUIVALENT	TO GROWERS OUTSIDE PROVINCE (PLANTS)	TOTAL PLANTS	$ FARM VALUE
1981	2,529,525	575	6,583,800	9,113,325	455,666
1982	2,188,880	497	7,637,950	9,826,830	520,882
1983	2,357,575	536	13,331,750	15,689,325	831,534
1984	2,770,025	629	13,285,835	16,055,560	931,222
1985	2,170,775	493	13,110,950	15,281,725	871,058
1986	2,754,400	626	12,985,850	15,740,250	912,934
1987	2,057,150	467	18,205,950	20,263,100	1,175,259
1988	1,501,180	341	21,019,425	22,520,605	1,306,195
1989	1,491,400	339	22,108,850	23,600,250	1,416,015
1990	1,581,975	359	24,050,615	25,632,590	1,640,485
1991	1,998,400	454	18,215,805	20,214,205	1,293,709

It is of interest to note the change in varieties planted in Nova Scotia during the past ten years. In 1981 Veestar was the only early variety which represented 34% of the planting. In 1991 there are four early varieties and these represent 40% of the plantings, with Veestar dropping in popularity to 15%, but still the single, most popular variety (Table 2.13).

In the mid-season group there were three varieties planted in 1981 with 12% planted to Redcoat. In 1991 Nova Scotia growers planted five mid-season varieties. The new variety Cavendish represented 13% while Redcoat declined to 4% of the new plantings.

In 1981, Micmac and Bounty represented 16 and 15 percent of the late-season plantings. In 1991 these two cultivars represented only 5% each, while the new cultivar Blomidon represented 12%.

The eight Kentville varieties represent 57% of the new plantings in Nova Scotia in 1991 (Table 2.13).

In 1991, 40% of the new plantings were made to four early varieties, 28% of five mid-season, and 22% of three late season. (Graph 2)

Fruit Marketing and Promotion

The reduction of the 1991 strawberry crop strengthened the market price. The U-Pick price went up about five cents per quart; the fresh market price went up $0.225 per quart; processing price remained the same. The overall farm gate strawberry price went from $0.919 per quart to $1.096 per quart or an increase of 0.177 cents per quart (Table 2.11). This price increase did not remain with the strawberry growers as it had to be paid for increased operating costs. The farm gate strawberry prices had not kept up with production costs for many years.

The strawberry production questionnaire indicated 58.5% of the fruit was marketed fresh; 36.5% Pick-Your-Own; and 5% processing (Table 2.10) (Graph 3).

The Board of Directors of SGANS was extremely busy during 1991. One of their objectives was to put into place a more effective marketing plan. They formed a Marketing Committee. They reviewed very closely the past and present marketing patterns then embarked on several initiatives to improve the 1991 market. They developed a Fresh Export Market plan and a Domestic Market plan.

The SGANS represented the strawberry industry at the Canadian Horticultural Council, the Nova Scotia Federation of Agriculture, Day-Haul and most recently the Farm Support and Adjustment Measures II program.

Strawberry Nursery Plant Production and Marketing

The Nova Scotia certified strawberry nursery plant program is still in a very strong and healthy position despite a drop in sales of 5.8 million plants in 1991 (Graph 4). A total of 20,214,205 plants were sold in 1991 representing a value of $1,293,709 (Table 2.5; Table 2.6). Sales to Nova Scotia strawberry growers are up over the past three years and almost equal to sales in 1987. In 1991 sales to Florida growers has dropped. Although the Florida market is very large, grower purchasing patterns can be very unpredictable.

The Nova Scotia nurserymen report sales of Northern plants have been very strong with increased orders from growers in United States.

In 1991, 89.1% of strawberry nursery plant sales were out of province, while 10.9% were sold within the province. In province sales were up 4.7% over 1990.

As part of the plant certification program, a total of five field inspections for Northern plants and three field inspections for Southern plants per nursery are made by a plant pathologist, entomologist, horticulturist and two to three technicians. Inspections are made in the packing house during fall and spring cleaning of the plants. In the fall, a root bait test is conducted by a plant pathologist. During the winter season, a technician checks the storage room temperature on a monthly basis.

All five nurseries were certified for the 1991-1992 season. A total of 138 acres were inspected.

These nurseries practice soil fumigation using their own equipment, and more recently contracting a small portion to Hendrix and Dial Inc., North Carolina. In the fall of 1991 this company fumigated 27 acres of strawberry land in Kings County. The fumigant used is methyl bromide and chloropicrin, then tarped.

In 1991, the Certified Strawberry Nursery Booth was set up at the following events.

January 24–25, 1991	Strawberry Growers' Association of Nova Scotia Annual Meeting, Coldbrook, Nova Scotia
February 10-13, 1991	North American Strawberry Growers' Convention St. Petersburg, Florida, U.S.A.
November 29-30, 1991	Nova Scotia Federation of Agriculture Annual Meeting Truro, Nova Scotia

A new video "Nova Scotia Certified Strawberry Nursery Program" was produced in 1990 and released early January 1991. This video was used at all major strawberry events as part of the Certified Strawberry Nursery Booth.

Major Strawberry Meetings

Strawberry Growers' Association of Nova Scotia The Annual Meeting of the Strawberry Growers' Association of Nova Scotia was held January 24–25, 1991, Coldbrook, Kings County. The theme for the convention was "Marketing Motivation and Communication". Theme speakers and panel on marketing included:

1. Orville Pulsifer, President, Pulsifer Associates, Hilden, Colchester County, Nova Scotia outlined a host of innovative ideas on how to market more successfully and reach beyond the present strawberry sales.

2. Dr. Don Shiner, Senior Consultant with Peat Marwick Stevenson & Kellogg; and Associate Professor, Mount Saint Vincent University, Halifax on the topic "Smoke and Mirrors or Marketing?".

3. Marketing and Stabilization Panel

    - Brian Smith, Director, Marketing Services Branch, Truro
    - Barb MacLean, Grower and President, SGANS, Greenhill, Pictou County
    - Brian Morse, Grower, Berwick, Kings County
    - Jan Swinkels, Grower, Vice-President, SGANS, Belmont, Col. County
    - Allison Woodworth, Grower, Berwick, Kings County

    A series of topics on production and promotion were included in the two-day convention. Dr. Marvin Pritts, Small Fruit Crop Management Specialist, Cornell University New York State, spoke on Strawberry Nutrition, New York Selections and Managing Day Neutral Plantings.

During 1991 a total of seven director meetings and two committee meetings were attended.

Strawberry Promotion Co–ordinator The position of Strawberry Promotion Co-ordinator with SGANS has seen several staff changes since 1990. This part-time position changed in 1991 from Bela Casson (4 years) to Elaine Gorman (4 months) to Shelley Helpard. Shelley, a Home Economics graduate from Mount Saint Vincent University, is also a Promotion Co-ordinator with the Turkey Marketing Board of Nova Scotia.

North American Strawberry Growers' Association The Annual Meeting of the North American Strawberry Growers' Association was held February 10–13, 1991, St. Petersburg, Florida. Strawberry growers, industry, university and government representatives from United States and Canada meet to exchange cultural and marketing information. A delegation of Nova Scotia growers and nurserymen, and Lorne Crosier, Entomologist, NSDAM attended this convention. The Strawberry Growers' Association of Nova Scotia sponsored a booth at the trade show explaining the Nova Scotia Certified Strawberry Plant Nursery Program.

Strawberry Projects

1. **Marketing and Motivating Seminar. Applicant: SGANS-AFDA (HRD-177). Program delivered January 24, 1991.**

2. **Strawberry IPM. Applicant: SGANS-AFDA (TIP-136); a four year program initiated May 1990. The results from the second year of the strawberry monitoring program printed in Plant Industry Project Report, 1991.**

3. **Development of a Mechanical Strawberry Harvester, AFDA (TDP-32). Applicant: Doug Bragg Enterprises, Collingwood, Cumberland County; project completed 1991.**

4. **Colour Sorting of Mechanically Harvested Strawberries AFDA (TIP-135). Applicant: Rainbow Farms, Upper Rawdon, Hants County; project completed 1991.**

5. **Evaluation of French Tunnels on Day Neutral Strawberries. Applicant: Terry and Dianne Wenham, Bass River, Colchester County; project completed 1991.**

6. **Certified Strawberry Plant Marketing Information. Applicant: SGANS-AFDA (MD-045B); project completed 1991.**

7. **Operation Spray Check. Leader: Lise LeBlanc, Plant Industry, NSDAM. A number of strawberry growers participated in this program. Project completed 1991.**

8. **Strawberry Quality Survey. Leader: Scott Hosking, Market Research Analyst, NSDAM Project completed 1991.**

9. **Direct Marketing in Nova Scotia (Reports)**
   1) Pick–Your–Own
   2) Roadside Markets
   3) Farmers' Markets
   Reports prepared by Gordon B. Kinsman, Truro with co-ordination by Agriculture Canada and Nova Scotia Department of Agriculture and Marketing. These reports are of interest to strawberry growers who participate in these markets.

10. **French Tunnels on Day Neutrals (AFDA-TIP 146). Applicant: Terry Wenham and Dianne, Bass River, Colchester County. Completed 1991. Details printed in Plant Industry Branch Project Results, 1991.**

11. **Strawberry Weed Control (TDP-147). Applicant: SGANS Approved for 1992–94.**

12. **Strawberry Plant Harvester (TDP-134). Applicant: Joe Cooper, Great Village, Colchester County. Completed 1991.**

13. **Strawberry Handling System (TIP-231). Applicant: Worth Much More Berry Co. Ltd., Berwick, Kings County. Completed 1991.**

14. **Strawberry Export Marketing (MD 271E). Applicant: Worth Much More Berry Co. Ltd., Berwick, Kings County. Project 1991-92.**

15. **Market Information and Strawberry Packaging (MD 287D). Applicant: Worth Much More Berry Co. Ltd., Berwick, Kings County. Project 1991-92.**

Education

Six strawberry newsletters and numerous factsheets were prepared.

Table 2.7: Nova Scotia Strawberry Nursery Sales by Per Cent

	1990	%	1991	%
Nova Scotia	1,581,975	6.2	1,998,400	10.9
Out of Province	24,050,615	93.8	18,215,805	89.1
Total	25,632,590	100	20,214,205	100

Strawberry Crop Insurance

The Nova Scotia Crop and Livestock Insurance Commission paid out $27,000 to seven of the 18 growers who were insured. This was the largest payout to strawberry growers in the 18 year history of the strawberry insurance program. The two major factors were spring frosts and summer drought. The 92 insured acres represented 13% of the production acreage (Table 2.14).

Strawberry Problems

1. **Plant Problems**

   During the past two springs, several growers have observed Blomidon plants with light green or yellow leaves. Sometimes just a portion or sector of the leaf is affected giving a streaked or mottled appearance. These symptoms are most commonly observed on new growth and young runners. These symptoms might be June Yellows, a progressively debilitating disorder that affects vigor and yield, ultimately leading to the death of affected plants in two or three years.

   The identity of this disorder may be confirmed by examining a number of clones. If June Yellows turns out to be the problem, Agriculture Canada may be able to prevent the loss of the cultivar Blomidon by finding clones that are less prone to the disorder. A request went out to strawberry growers in NSDAM Strawberry Newsletter, Number 5, 1991, seeking older clones of Blomidon, preferably plants from commercial fields that were set out between 1985 and 1988. Dr. Andrew Jamieson plans to propagate these old clones in 1992 and set out field trials in 1993 to compare them with current stock.

2. **Insect Problems**

   Thresholds for timing of insecticide applications must be developed for strawberry weevil and cyclamen mite.

3. **Weed Problems**

   A few growers are reporting increase problems with field mint, toadflax and St. John's Wort. A herbicide study will be developed in 1992 to explore these problems.

4. **Renovation Studies**

   Several renovated fields were showing plant decline after herbicide applications. This problem will be explored in 1992.

Table 2.8: Acreage — Nova Scotia Summary

YEAR	ACRES PLANTED	FIRST YEAR PRODUCING	CARRY-OVER FIELDS	TOTAL ACRES HARVESTED
1970	308	323	98	421
1971	304	308	91	399
1972	309	304	75	379
1973	324	309	73	382
1974	285	324	75	399
1975	366	285	100	385
1976	397	366	160	526
1977	394	397	200	597
1978	418	394	200	594
1979	486	418	209	627
1980	506	486	244	730
1981	575	506	452	958
1982	497	474	503	1078
1983	536	497	548	1045
1984	629	536	564	1100
1985	493	629	521	1150
1986	623	493	507	1000
1987	467	600	500	1100
1988	341	460	540	1000
1989	339	341	309	650
1990	359	339	361	700
1991	454	359	391	750
1992	–	454	396	850

Table 2.9: Market Distribution of Nova Scotia Strawberries (000's quarts)

YEAR	NOVA SCOTIA FRESH SALES *	OTHER PROVINCES FRESH SALES	EXPORT	PROCESSING	TOTAL
1991	2,590.0	260.0	**	**	3,000
1990	3,309.0	343.5	**	**	3,800
1989	3,583.0	304.5	**	112.5	4,000
1988	3,742.0	300.5	**	457.8	4,500
1987	2,962.0	261.0	–	277.2	3,500
1986	2,843.0	378.0	–	297.0	3,500
1985	4,435.8	271.2	42.0	251.0	5,000
1984	4,154.4	342.0	–	500.0	5,000
1983	3,687.0	180.0	–	433.0	4,300
1982	3,627.0	138.3	–	234.7	4,000

* Includes wholesale and Pick-Your-Own Sales

** Confidential, included in totals

Table 2.10: Percent Distribution of Strawberry Marketing, Nova Scotia

YEAR	PICK-YOUR-OWN	WHOLESALE	OTHER PROVINCES AND EXPORT, FRESH	PROCESSING
1991	36.5	49.8	8.7	5.0
1990	40.0	47.1	9.0	3.9
1989	35.0	54.6	7.6	2.8
1988	30.0	53.1	6.7	10.2
1987	35.0	49.6	7.5	7.9
1986	30.0	50.7	10.8	8.5
1985	35.0	53.7	6.3	5.0
1984	40.0	43.1	6.9	10.0
1983	55.0	30.8	4.2	10.0
1982	68.7	22.0	3.4	5.9

Table 2.11: Nova Scotia Strawberries 1991 - Farm Gate Value

WHOLESALE/RETAIL		
1,494,000 quarts @ $1.28/quart[1]	=	$1,912,320
PICK-YOUR-OWN		
1,095,000 quarts @ $0.90/quart	=	$985,500
OUT OF PROVINCE AND PROCESSED		$390,180
TOTAL VALUE, FARMGATE[2]		$3,288,000

Weighted average farm gate price (Wholesale Market Sales)	=	$1.28/quart
less containers		-.25
farm gate price, fruit only		$1.03/quart

Weighted average farm gate return $1.096 per quart

[1] includes containers

[2] value for 3,000,000 quarts

Table 2.12: Annapolis Valley Shipments, Fresh Strawberries, 1991

	QUARTS	DELIVERED RETAIL PRICE	(AVERAGE)	F.O.B. GROWER PRICE
June 19 - Wed	324	2.30-2.45	(2.38)	-
June 21 - Fri	120	2.30-2.45	(2.38)	-
June 24 - Mon	4,548	2.30-2.45	(2.38)	-
June 25 - Tues	5,520	2.35-2.45	(2.40)	-
June 26 - Wed	4,368	2.30-2.45	(2.38)	-
June 27 - Thurs	14,112	2.20-2.35	(2.28)	-
June 28 - Fri	8,628	1.75-2.28	(2.00)	-
July 2 - Tues	47,316	1.48	-	1.10
July 3 - Wed	14,844	1.48	-	1.10
July 4 - Thurs	26,100	1.48	-	1.10
July 5 - Fri	15,840	1.50-1.75	-	1.20-1.40
July 8 - Mon	27,724	1.50-1.75	-	-
July 9 - Tues	25,512	1.50-1.75	-	-
July 10 - Wed	25,072	1.50	-	1.25-1.40
July 11 - Thurs	23,304	1.50	-	1.30
July 12 - Fri	19,148	-	-	1.30-1.40
Sunday - rain	-	-	-	-
July 15 - Mon	2,748	1.50	-	1.30-1.40
July 16 - Tues	15,104	1.60-1.75	-	1.40
July 17 - Wed	8,460	1.60-1.75	-	1.40
July 18 - Thurs	13,200	1.60-1.75	-	1.40
July 19 - Fri	6,360	1.60-1.75	-	1.40
July 22 - Mon	5,220	1.70	-	1.50
July 23 - Tues	6,120	1.70-1.75	-	1.50
July 24 - Wed	1,800	1.75	-	1.50
TOTAL SHIPMENTS	321,492			

Source: N.S. Department of Agriculture and Marketing

Table 2.13: Strawberry Plant Sales (percent of total) in Nova Scotia, 1981–1991

Cultivar	'81	'82	'83	'84	'85	'86	'87	'88	'90	'91
Early Season										
Veestar	34	37	27	29	21	17	18	24	17	15
Annapolis	-	-	7	5	6	6	9	8	6	12
Cornwallis	-	-	3	7	7	4	4	2	1	1
Honeoye	-	-	-	5	7	7	11	11	14	12
Midseason										
Redcoat	12	5	5	5	2	17	4	4	2	4
Raritan	8	7	6	3	<1	2	3	<1	3	2
Kent	5	11	10	9	26	20	22	13	13	8
Glooscap	-	-	5	8	3	6	5	5	4	1
Cavendish	-	-	-	-	-	-	-	-	9	13
Late Season										
Bounty	15	15	18	11	11	5	6	6	4	5
Micmac	16	15	10	14	13	7	9	5	8	5
Blomidon	-	-	-	1	3	5	6	19	15	12

Varieties within each seasonal grouping are ordered from the oldest to the youngest.
Years do not total 100 due to other minor varieties.

Table 2.14: Strawberry Crop Insurance

FISCAL YEAR	CONTRACTS	INSURED	ACRES	CLAIMS	CLAIMS PAID
1974	37	37	154	16	$19,224.47
1975	30	30	99	6	2,345.13
1976	28	28	117	8	6,799.00
1977	28	27	99	6	3,775.30
1978	21	18	78.5	1	3,659.00
1979	18	18	64	6	4,797.80
1980	22	22	90	2	11,015.90
1981	22	22	96.4	8	18,585.00
1982	23	23	109	2	3,212.00
1983	22	22	116	4	5,314.00
1984	20	20	97	3	1,800.33
1985	23	23	85	1	1,626.00
1986	23	23	101	9	26,705.75
1987	15	15	63	1	179.60
1988	18	18	67	0	0.00
1989	15	15	71	0	0.00
1990	15	15	70	2	2,900.00
1991	18	18	92	7	27,000.00

Figure 2.1: Nova Scotia Producing Acres

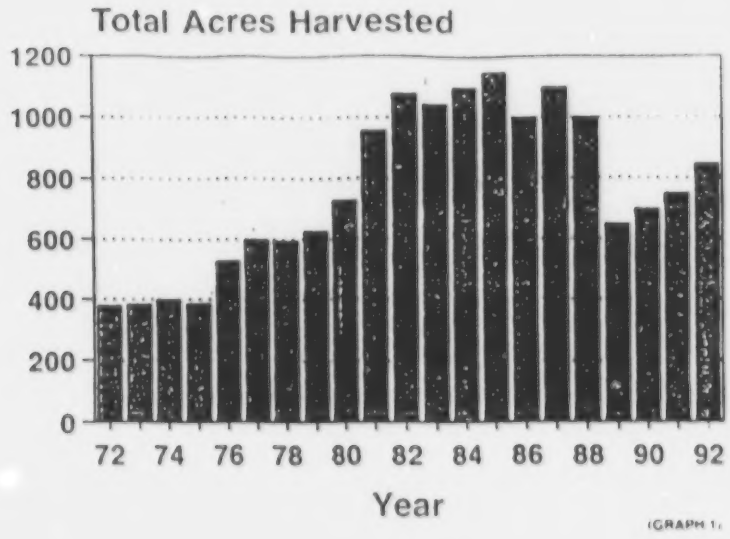


Figure 2.2: Strawberry Plant Sales in Nova Scotia

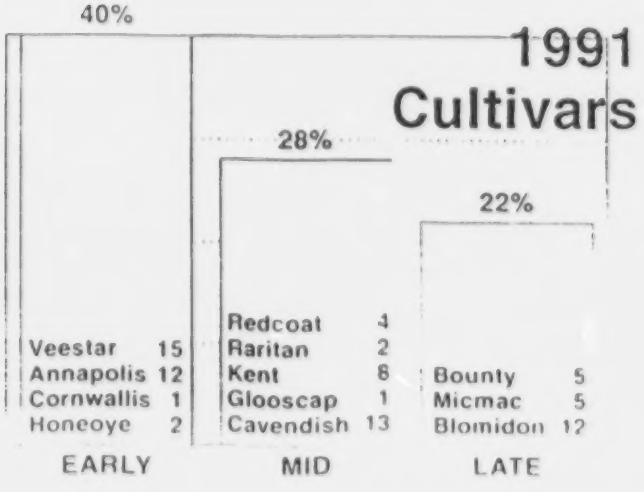


Figure 2.3: Nova Scotia Strawberry Production Disposition

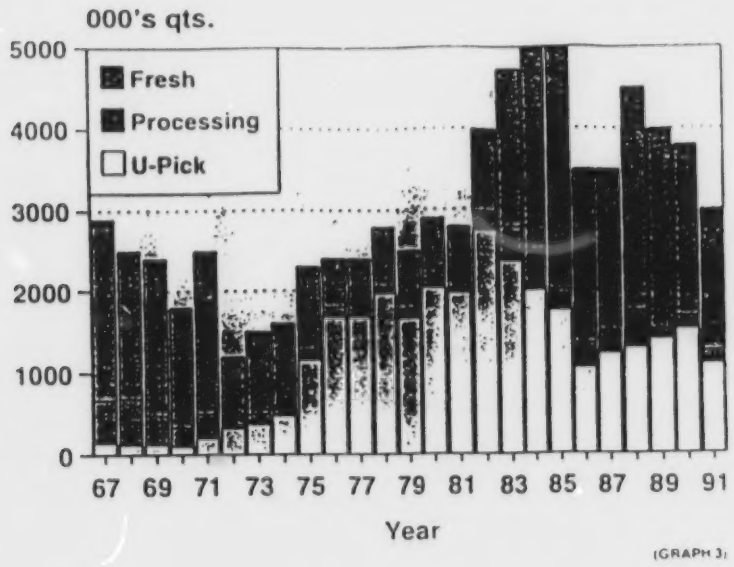
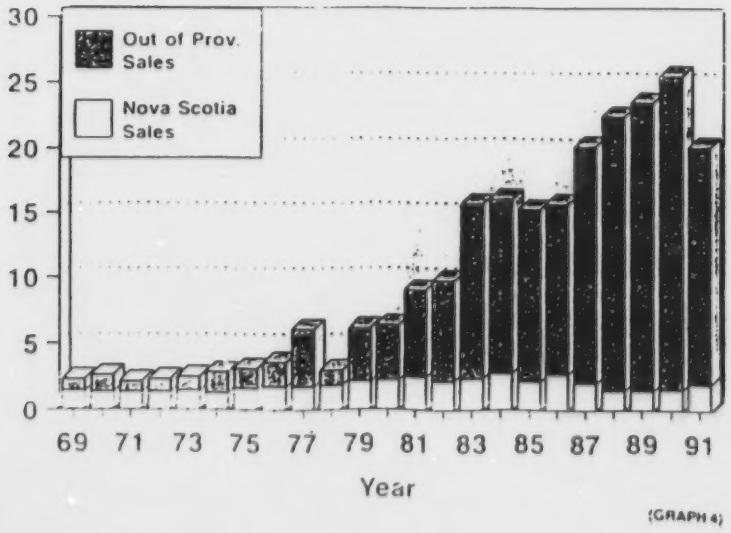


Figure 2.4: Nova Scotia Strawberry Nursery Sales (Millions - Plants)



2.3 GRAPES

Nova Scotia has 34 active grape growers with about 140 acres of managed vineyards in seven counties. There were 5.4 new acres planted, and 15 acres decertified or removed.

Grape production in 1991 was estimated at 183 tons. Approximately 93 tons of red grapes and 90 tons of white were harvested. If three or four vineyards had escaped frost damage in mid-May, and if less rain occurred in September, Nova Scotia's grape crop would have well exceeded 200 tons. Over 25 ton was lost to frost and botrytis fruit rot in September.

The warm dry weather from May to the end of August was ideal for grape production. The cool wet weather in September reduced the expectation of a vintage year. Incidents of mildew and botrytis was more apparent on Michurinets in some vineyards due to the damp weather.

The Michurinets cultivar is very vigorous which can develop excess foliage if adequate pruning and trellising techniques are not used.

Most growers are using mist sprayers, while a couple growers are using a spray gun.

Educational Activities 1991

1. January 19 – Grape Information Update at January 1991 annual meeting.
2. September 25 – Valley Grape Growers' Tour and Information Session.
3. November 27 – Grape Seminar – Josef Zimmermann, N.S.A.C., Truro. An excellent update on grape production in Ontario. A new video on Grape Pruning was viewed. This video will be purchased and will be available from the Plant Industry Branch, Truro, to grape growers.
4. Grape Newsletter - Five (5) issues; and updated factsheets.

Grape Projects

1. *Grape Rootstock and Scion Evaluation*-AFDA-TDP 39. Applicant: GGANS. The rootstock/scion combinations were planted during the spring of 1991 at the following vineyards:
   - Corkum Vineyard, Falmouth, Hants County
   - Walter Wuhrer, North Kingston, Kings County
   - Habitant Vineyards, Habitant, Kings County
   - Jost Vineyards, Malagash, Cumberland County

   Details of the rootstock/scion combinations contained in Grape Newsletter, Number 4, November 13, 1991.

2. *Grape Trellising and Canopy Management*-AFDA-TDP 37. Applicant: GGANS

   This is year two for the trellising and canopy management project at the following vineyards:
   - McLelland Vineyard, North Grand Pre, Kings County
   - Habitant Vineyard, Habitant, Kings County
   - Corkum Vineyard, Upper Falmouth, Hants County

   Early results indicate the V Trellis can be recommended for L'Acadie Blanc. Pollux appears to be performing well on the V Trellis. Details of this project are reported in Grape Newsletter, Number 4, November 13, 1991.

   A video of spring and fall growth has been recorded at each site.

3. *Database of Vineyard Profiles*-AFDA-TDP 79. Applicant: GGANS. This project is located at the following vineyards:

- Walter Wuhrer, North Kingston, Kings County
- Habitant Vineyard, Habitant, Kings County

Leaf and petiole analysis and lime applications were carried out in 1991. Details of this project are reported in Grape Newsletter, Number 4, November 13, 1991.

4. *Climatic Evaluation of Nova Scotia Vineyards* - AFDA TIP-137. Applicant: Robert Gordon, NSDAM

   Ten manual climate stations were installed in five counties in 1991. In 1992 grape growers will be provided bi-weekly weather summaries during the growing season and a quarterly summary during the winter months. Measurements at the selected vineyards (by the growers) will include daily maximum and minimum air temperatures, daily rainfall during the growing season, and snowfall depth on the ground during the winter months.

5. *European Floating Arm Weeder*-AFDA TIP 105. Applicant: McLelland Vineyards, North Grand Pre, Kings County. The original Pobalti brush tree weeder arrived without some of the necessary components. When the machine was placed in service the nylon brushes failed to work effectively. Nylon brushes were replaced with stiff steel cables and the rotational speed was reduced. The results were positive. The modified Pobalti has the potential to replace the use of heavy cultivating and herbicides in a vineyard operation. Project completed 1991. Report printed in Plant Industry Project Report, 1991.

Nova Scotia Farm Wineries

1. *International Wine Competition* Sainte Famille Wines Ltd., Upper Falmouth, Hants County and Jost Vineyards Ltd., Malagash, Cumberland County received awards for their wines in three separate 1991 wine competitions held in United States.

   Sainte Famille Wines Ltd., a Gold for their 1989 Michurinets at the International Eastern Wine Competition, New York, July 1991; and a Bronze for their 1989 Marechal Foch at InterVin International, Upstate New York, July 1991. Both wines from 100% Nova Scotia grapes.

   Jost Vineyards Ltd., a Silver for their 1990 Habitant Blanc (V-53261); a Bronze for 1990 Roving Princess Geisenheim. These two wines were from 100% Nova Scotia grapes.

2. *Local Farm Winery Events*

   - 1991 Winefest Results - The third annual Winefest, sponsored by the North Shore Bavarian Society was held in Tatamagouche, July 13, 1991. Three Nova Scotia farm wineries offered selected wines to be tested and judged. There were ten official wine testers, all volunteers from the Winefest. Nine wines were tasted from Jost Vineyards, Malagash; Grand Pre Wines, Grand Pre; and Sainte Famille Vineyard, Falmouth. The tasting was done twice and the results were averaged. First place went to Sonnenhof Vidal 1988 and second place, to Riesling Gold 1986, both Jost Vineyard wines. Third place went to Gold Bell from Sainte Famille.
   - Tatamagouche Oktoberfest, September 27-28, 1991 - The largest Oktoberfest east of Kitchener, Ontario was held in Tatamagouche, September 27 and 28, 1991, sponsored by the North Shore Bavarian Society. The village of Tatamagouche was decorated in the Oktoberfest theme and trophies were presented to the best decorated business.

     Food concessions had traditional German food, Sausage, Sauerkraut, Strudel and much more. The official wines to be used at the 12th annual Oktoberfest were selected at the Annual Winefest held in Tatamagouche, July 13, 1991. These wines include Sonnenhof Vidal 1988, Riesling gold 1986 from Jost Vineyards; and Gold Bell from Sainte Famille Vineyards.

Grape Growers' Association of Nova Scotia

The Annual Meeting of the Grape Growers Association of Nova Scotia was held at Kentville, January 19, 1991. The annual meeting was devoted to a general vineyard management update, review of project reports and resolutions. The resolutions included:

1. To support the continued Crown Gall research work of Dr. Colin Bell, Acadia University.
2. To increase the director representation from the Nova Scotia Farm Wineries from two members to three, and to increase the total Board of Directors to twelve.
3. Request the province to establish promotional highway signage on series 100 and secondary roads depicting the location of Nova Scotia's three farm wineries.
4. To allow Sunday afternoon openings of farm wineries during the tourist season.
5. To allow farm wineries to offer pertinent food for sale.

One directors' meeting and two committee meetings were attended in 1991.

1991 Grape Survey Report

The 1991 Grape Survey Report identifies the number of active growers and acreage by county and a summary of yield from 1981 to 1991 and identifies the three farm wineries. Section 1.3 GRAPES of this report outlines this data.

2.3.1 RASPBERRY–BLACKBERRY

The 1991 raspberry crop is estimated at 175,000 pints, up 15,000 pints from 1990 (Table 2.4). There are about 45 acres in production, although Statistics Canada records 65 acres of raspberries in production. The yields are variable because of winter injury, cane gall and a fall bearing trait on the cultivar Nova.

The U-Pick price ranges from $0.90 to $1.20 per pint; fresh market returns from $1.50 to $1.75 per pint.

One grower has 2–3 acres of blackberries and is enthusiastic about the cultivar Hull. With limited production the market price was strong with farm gate price $2.00 to $2.50 per pint. Retail up to $4.00 per pint in Halifax.

The Bramble Growers' Association of Nova Scotia held their founding meeting November 24, 1990. They held a brief business meeting on July 30, 1991 on the same day as their Bramble Field Day. The field day consisted of a tour of the raspberry and blackberry trials at the Kentville Research Station and a tour of Stephen and Jacqueline Rand's three-acre blackberry planting, Lower Church Street, Kings County.

Certified Raspberry Nurseries

Nova Scotia's two certified raspberry nurseries are located in Kings County. They had sales of approximately 350,000 canes to growers from Newfoundland to Manitoba (Table 2.4).

As part of the certification program three field inspections were made for insect and disease. The inspection team includes a plant pathologist, entomologist, horticulturist and two or three technicians.

At the request of the two certified raspberry growers, the Atlantic Advisory Committee on Berry Crops at their meeting November 5–6, 1991 supported a resolution regarding the export of Nova Scotia raspberry stock to the United States. The resolution read ... "That the Plant Protection Division, Agriculture Canada request that the USDA grant an interim exemption to permit entry of Nova Scotia certified raspberry nursery stock to the United States without the two year post entry quarantine procedure".

2.3.2 HIGHBUSH BLUEBERRY

The 1991 highbush blueberry crop is estimated at 250,000 pints, about 50 percent below the potential of the existing plantings (Table 2.4). Blueberry Acres, Upper Canard, Kings County, the largest highbush blueberry farm has a new owner. One third of this acreage was completely renovated in 1991. The yields on the remaining two-thirds were below potential. This section will be renovated in the next couple of years. Despite the lower yields the major portion of the highbush blueberries were exported to Boston and Montreal. The remainder of the fruit from smaller plantings were sold on the local fresh market and U-Pick.

The early fresh prices were low in Montreal and Boston. The late season price (September–October) in Boston ranged from $3.00 to $4.00 per pint. U–Pick price was $0.90 per pint.

Labor to harvest the late blueberries became a problem because of the wet weather. October 14 was the last picking for commercial harvest.

One of the more urgent research problems is to evaluate and register new controls for Godronia Canker and Anthracnose.

The Highbush Blueberry Growers' Association Annual Meeting and Seminar was held at the Kentville Agricultural Centre, April 5, 1991.

2.3.3 CRANBERRY

The 1991 cranberry crop is estimated at 500,000 pounds, up 50,000 pounds from 1990 (Table 2.4). The Halifax wholesale paying price is $18.00 to $21.00 (24 x 12 oz.) unchanged for the past few years despite a temporary fresh cranberry shortage in Massachusetts. One large Nova Scotia cranberry grower was asked from a broker in Boston for their entire supply. This company refused the offer as they had a loyalty to supply their local Atlantic Canada wholesalers.

Cranberry harvest started September 15 and ended approximately October 15. Fresh Nova Scotia cranberries were available to consumers in Atlantic Canada until the end of December 1991.

The shortage of fresh cranberries in Eastern United States created a rash of inquiries from people in Nova Scotia requesting information to develop new cranberry bogs.

Bezanson and Chase Cranberry Company, Aylesford, was the site for a scene in the movie "The Secret", starring Kirk Douglas. They were at Aylesford October 15 and Chester for a couple of weeks. Film Nova Scotia contacted the Plant Industry Branch for possible cranberry sites for this film.

North American Cranberry Conference

The 9th North American Cranberry Research and Extension Workers' Conference was attended at Cape Cod, Massachusetts from September 18 to 21. The Conference was co-hosted by the Massachusetts Cranberry Experiment Station and Ocean Spray Cranberries, Inc. There were 70 cranberry workers, 14 accompanying persons and several invited guests from five states, British Columbia and Nova Scotia. This was the largest group at any of the conferences, and more than double the first group that met in Massachusetts in 1975. Nova Scotia hosted the North American Conference in 1986.

Highlights of the Conference

- Twenty-five oral paper presentations on pathology, entomology, weed control, physiology, nutrition, culture, breeding and genetics were presented in two morning sessions.
- Twenty-one poster presentations were on display on similar topics including two posters on remote sensing.
- A one-day and two afternoon sessions were devoted to field tours.
- Another one-half day was scheduled to two plenary sessions on breeding, varieties and pesticide issues and two concurrent working sessions covering major cranberry topics.
- Ocean Spray provided participants with a binder containing 1990 Cranberry Agricultural Research Progress Reports. This is the first annual collection of Cranberry Agricultural Research Progress Reports. Every three years a subject and author index will be included. The 1990 report contains 43 research papers.

Cranberry Research Required A. Ocean Spray's Request

1. Require an environmental component with particular reference to surface water.
2. Require more sound research into use of fertiliser.
3. To use water more efficiently.
4. Plant breeding is important.

B. Work Sessions to Define Research Requirements

1. Plant Nutrition Studies.
2. Plant Physiology.
   - Effects of sanding.
   - Need to know more about the basic physiology of the cranberry.
   - Root systems of cranberry cultivars in various regions of North America.
3. Insects
   - Insect behaviour. How does the fruitworm know when to lay eggs on the cranberry flowers?
4. Effects of frost and cold injury.

New Cranberry Products

- Ruby Red Grapefruit Juice
- Craisins (sweetened dried cranberries)
- Educational Cranberry Video – "Cranberry Bounce" – produced by Ocean Spray/British Columbia Cranberry Growers. Excellent for Agricultural Awareness program. A copy of this video was purchased and is in the Plant Industry Branch, Berry Crop Section Video Library and is available on loan.

Project

1. Cranberry Nutrition Trial Applicant: Dew Drop Garden (Jim Keiser), Grants Cove, Halifax County

A trial using superphosphate and agricultural limestone was established on the Keiser cranberry bog, May 24, 1990, to determine if a treatment may overcome a natural high zinc level which may cause a fruit abortion problem. Yields were recorded, October 4, 1990 and October 1991. The results were not conclusive. The owner now feels the low yields could have been the result of a fungicide application during bloom.

Education

- A report of the 9th North American Cranberry Conference was mailed to all Nova Scotia cranberry growers.
- The agenda, paper titles, and abstracts were distributed to Federal and Provincial staff members involved in the Nova Scotia cranberry industry.
- A binder outlining in detail all the Cranberry Agricultural Research 1990 Progress Reports is available in the Truro and Kentville offices, Plant Industry Branch, NSDAM.

2.3.4 SAANICHTON PLANT QUARANTINE STATION

Nova Scotia Department of Agriculture and Marketing and Agriculture Canada, Kentville hosted the annual meeting of the Saanichton Plant Quarantine Station, Sidney, British Columbia at Kentville on November 25–26, 1991. Dr. Andrew Jamieson, Research Scientist, Agriculture Canada, Kentville and Robert Murray, Senior Horticulturist, Nova Scotia Department of Agriculture and Marketing, Truro, co-chaired the annual meeting, banquet and tour.

This was the first time the SPQS held their annual meeting in Nova Scotia, and the second time held outside of British Columbia. The SPQS has representatives from the Federal and Provincial Departments of Agriculture and Industry. Industry representatives include tree fruits, grapes and plant nurseries. Since this meeting was held in Nova Scotia, the Nova Scotia Fruit Growers' Association; the Grape Growers' Association of Nova Scotia; and Landscape Nova Scotia were invited to attend the annual meeting as observers.

The detailed account of the annual meeting is on file, Plant Industry Branch, Truro.

2.3.5 OTHER MEETINGS, COMMITTEES, EVENTS*

- Farm Health and Safety Committee Meetings, Truro, March 19–20
- Limestone Committee Meeting, Truro, April 10
- NSDAM Safety Committee Meeting, Truro, April 12
- Elderhostel – "Nova Scotia Grape Industry", Wolfville, April 23
- Computer Literacy Course, Truro, June 17, 18, 19
- Farm Pond Committee Meeting, Truro, June 21
- Judging Farm Safety Provincial Finals, Truro, October 26
- APASCC Berry Crops, Memramcook, New Brunswick, November 5–6
- Climate Change Workshop, Dartmouth, November 19
- Nova Scotia Federation of Agriculture Annual Meeting, November 29
- Plant Industry Branch, Horticulture Sector Meeting, Kentville, October 22; General Meeting, Truro, December 17

* Not referred to in Annual Report

2.3.6 FARM POND PROGRAM

The Farm Pond Program is administered by the Plant Industry Branch, with farm pond recommendations and site inspections by staff of the Agricultural Engineering Section, Extension Services.

In 1991-92 fiscal year, 48 farm pond applications were received. Twenty-nine(29) applications were approved for $101,950; 16 farm ponds were built or enlarged in eight counties for $45,300.52. Five farm ponds built in 1990 received funding in 1991 to the amount of $12,575.64 as payment for Phase 2 of the project. A total of $57,876.16 was spent on farm ponds in the 1991- 92 fiscal year.

Table 2.15: Farm Pond Program

FISCAL YEAR	APPLICATIONS APPROVED AND COMPLETED	COUNTIES	ASSISTANCE
1983-84	18	8	$39,556.94
1984-85	19	5	48,291.00
1985-86	16	5	61,474.64
1986-87	23	5	64,695.56
1987-88	21	7	52,356.92
1988-89	20	10	33,498.28
1989-90	15	7	35,043.96
1990-91	21	9	70,386.38
1991-92	16	8	45,300.52
	5 carryover		12,575.64

48 applications received
29 applications approved for $101,950 funding
14 applications cancelled
14 ponds completed for financing
1 pond not completed

2.3.7 ACKNOWLEDGEMENTS

The Berry Crop Program receives support from many co-operators within the Nova Scotia Department of Agriculture and Marketing, Agriculture Canada, other Provincial and Federal Agencies. Farm organizations and private industry work closely with the Berry Crop program.

Special appreciation is extended to technicians Andrew King, John Arnold, Kim Best and to stenographers Beth Hingley and Janet MacGregor.

2.4 LOWBUSH BLUEBERRY

Jack Sibley, Horticulturist
Dale McIsaac, Horticulturist
Andrew King, Technician

2.4.1 OVERVIEW

The official figure for Nova Scotia's 1991 lowbush blueberry crop is 27,940,676 pounds (12,673,890 kgs). The previous five-year average figure (1986 to 1990) is 19,313,661 pounds (8,760,676 kgs) and the previous crop record, in 1990, was 27,994,286 pounds (12,698,208 kgs). Distribution of the 1991 crop was as follows:

	lbs (kgs)	% of Total
Processed in Nova Scotia Plants	20,855,898 lbs 9,460,235 kgs	74.6 %
Exported for Processing to U.S.	6,629,075 lbs 3,006,948 kgs	23.8 %
Exported to Other Canadian Provinces for Processing	137,572 lbs 62,402 kgs	0.5 %
Fresh Fruit Sales in Nova Scotia	318,131 lbs 144,304 kgs	1.1 %
Total	27,940,676 lbs 12,673,890 kgs	100.0 %

The 1991 growing season turned out very well despite some very cold ("almost a frost") nights throughout the bloom period and three weeks of very dry weather in July.

There were no serious insect or disease problems other than some isolated infestations, which were quickly brought under control. Pollinating weather during the bloom period was good in most areas, but there were still some problems with the quantity and quality of honeybee colonies available for pollination. Wild pollinators were abundant in most smaller fields as they have been for the past several years.

Scattered light rainfall reappeared in most areas in late July and early August and heavy soaking rains on August 19 and August 21 provided abundant moisture at the ideal time for mid-season and late fields. Most fields harvested during the last two weeks of August or early in September had all-time record yields. There were no excessively hot humid days during the harvest season, and the quality of the fruit was excellent. Scheduling of the harvest by shutting down harvesting crews was not necessary this year because of several rainy days during harvest and the increased use of mechanical harvesters.

Growers received 50 cents per pound for the crop this year. The previous five-year average price is 53 cents per pound. The total farm gate value of the 1991 crop is $13,970,338

2.4.2 INDUSTRY TRENDS

There has been a noticeable trend over the past several years to more sophistication in the blueberry industry. Technology is advancing at a rapid rate and new methods are being quickly adopted throughout the industry.

The large scale clearing of new acreage has slackened considerably in the past few years and growers are concentrating on improving existing acreage. Levelling of rough fields, so they can be mechanically pruned and harvested has become the main land improvement technique being employed. Levelling with an excavator

is providing a way to transform rough and rocky acreage dramatically and quickly into level productive acreage with little or no crop loss.

Each year, more acreage is being pruned by mowing and harvested mechanically. In some areas, 60 to 70 percent of the total acreage is being managed in this manner. As levelling of rough acreage continues, this trend to mechanical pruning and harvesting will continue at a rapid rate.

Research in weed control is concentrating on chemicals and methods to deal with escape weeds which survive and prosper following Velpar treatments.

An insect survey has been carried out in Nova Scotia fields for the past several years and has been very effective in pinpointing and controlling potential outbreaks before they become serious. There is a notable trend toward increased insect problems in fields which have been pruned by mowing for several cropping cycles.

2.4.3 PRINCIPAL EXTENSION ACTIVITIES AND PROJECTS

Winter Information Meetings

In co-operation with the Blueberry Producers' Association of Nova Scotia and the Agricultural Representatives in the various blueberry producing areas of the province, a series of winter extension information meetings were held as follows:

Table 2.16: Winter Extension Information Meetings 1991

Date	Location	Grower Attendance
January 7	Bass River	51
January 16	Westchester	29
January 23	Parrsboro	45
January 28	Blue Mountain	40
February 11	Gore	15
February 18	Bridgewater	12
February 25	Dean	25
March 4	Goshen	15
March 14	Yarmouth	15
Total		247

Spring Field Day Meetings

A series of field meetings were held in June to discuss and explain, in a field setting, weed, insect, and disease problems with growers (Table 2.17). Assistance was provided by Specialists from the Plant Industry Branch and the Nova Scotia Agricultural College. These sessions provided an excellent forum for educating growers on pest identification and control.

Co-operative Activities with Growers' Association

A number of projects and activities to promote the development of the blueberry industry were undertaken in close association with the Blueberry Producers' Association of Nova Scotia. Some of these included:

- The annual field day and tour held in the Musquodoboit and Dean areas, August 4 (attendance, approx. 160 people).
- Monthly meetings of the Association's Board of Directors.

Table 2.17: Spring Extension Information Meetings 1991

Date	Location	Grower Attendance
June 7	Gore	11
June 7	Debert	8
June 10	Westchester	14
June 10	Dean	11
June 12	Blue Mountain	14
June 12	Lochaber	8
June 14	Parrsboro	9
Total		75

- Periodic meetings of the Research Committee of the Association to review research needs of the industry and initiate research activities.

- The annual business meeting of the Association, November 22 and 23.

- Various promotion and marketing activities including:

  - Operation of the Blueberry Patch at the N.S./N.B. border.
  - Participation in various food promotion shows.
  - Work in support of the annual blueberry harvest festival and other local blueberry festivals.
  - Development and printing of various promotional pamphlets and brochures.

Preparation and Publication of Newsletters

Five newsletters containing current information on upcoming meetings and general industry news were prepared and mailed out to growers during the year.

The Nova Scotia Blueberry Institute

The Nova Scotia Blueberry Institute's activities in the 1991 season were both active and productive. A number of new projects were initiated and ongoing projects continued to receive support.

Activities at the Field Station (located in the Debert Air Industrial Park) in 1991 included: the general maintenance of Institute buildings, demonstration areas, and research plots; the provision of field sites for new and ongoing trials; and the provision of support to the researchers and their projects by the Field Manager and two summer students.

Some of the research projects and industry activities assisted by Extension Personnel and the Institute are:

	Project Leader
Two and three year management study	Dr. Leonard Eaton
Effect of Rolling on Soils and Blueberry Yields	Delmar Holmstrom
Pollinator Survey	Dr. Leonard Eaton
Data Base Survey	Dr. Leonard Eaton
Effect of Head Speed Ground Speed Ratio on Picking Effectiveness of a Mechanical Harvester	Kevin Sibley
Long Term Effects of Herbicides	Dr. Leonard Eaton
Plant Growth Regulator Trials	Dr. Hal Ju
Pollinator Study	Jeff Hoyle/Susie Blatt
Irrigation Study	Dale McIsaac
Select Clone Hybrid Seedling Plantings	Dr. Leonard Eaton
Annual Report	Andrew King

Land Clearing and Improvement Policy

Assistance for clearing and improving lowbush blueberry land was available under the Soil and Water Management Program of the N.S. Department of Agriculture and Marketing. A summary of work carried out under this program in 1991 can be found in Table 2.18.

Table 2.18: Summary of 1991 Land Clearing and Improvement Policy

Blueberry Land Clearing	296 acres	$58,260.31	$200/acre
Blueberry Land Levelling and Improvement	1757.9 acres	$557,781.87	$317/acre
Firebreak Construction	40,061 feet	$5,096.77	13 cents/ft

Information Coordination and Consulting Services

One of the principal activities in the blueberry extension program is the provision of a consulting and coordinating service for all phases of the blueberry industry including growers, other government departments, etc.

Land Assessments and Evaluations

Requests for land assessments are received on a regular basis from potential new growers, persons or companies buying or selling blueberry land. The healthy state of the industry creates a continuing interest in the development of potential acreage and the improvement of established fields.

Attendance at Annual Meetings and Conferences of International Wild Blueberry Organisations

The annual meetings of the Wild Blueberry Association of North America (WBANA) and the North American Blueberry Research and Extension Workers were held at Chicoutimi, Quebec, April 24-26. Attendance at these meetings provided an excellent opportunity for an exchange of information and consultation on extension and research activities.

Research Projects on Lowbush Blueberries in Nova Scotia

Lowbush research in Nova Scotia is carried out mainly by researchers at the Nova Scotia Agricultural College at Truro, N.S. and Agriculture Canada Research Station at Kentville, N.S.. There are also some projects at other Universities and occasionally a project carried out by private industry, the Blueberry Producers' Association or a private consulting company. Most projects involve a cooperative effort between the researcher, extension personnel and the Nova Scotia Blueberry Institute staff. Since its inception in 1982, the Nova Scotia Blueberry Institute has provided support and encouragement for research through provision of land, facilities, and equipment, as well as personnel. In addition, the Institute provides a communication link between researchers, extension workers, administrators, and producers.

Research Projects of Nova Scotia Agricultural College Personnel

- Storage conditions and shelf-life quality of blueberries (Researcher: Dr. Sam Asiedu, Plant Science Dept.)
- Colour and pigment stability in lowbush blueberries (Researcher: Dr. Nancy Crowe, Chemistry and Soil Science Dept.)
- Long-term effects of herbicides and fertilizers on lowbush blueberries (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Two year versus three year management of lowbush blueberries (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Database survey for lowbush blueberries (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Gypsum and limestone as soil amendments (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Effects of honeybee and native pollinators on fruit set and yields in lowbush blueberries (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Recovery of blueberries after land levelling (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Interplanting of Select Clone Seedlings to Increase Yields in Natural Stands of Lowbush Blueberry (Researcher: Dr. Leonard J. Eaton, Biology Dept.)
- Growth regulator trials on lowbush blueberries (Researcher: Prof. Hal Ju, Plant Science Dept.)
- Weed control in lowbush blueberries (Researcher: Prof. Glen Sampson, Biology Dept.)
- Effect of head speed ground speed ratio on picking effectiveness of a lowbush blueberry harvester (Researcher: Prof. Kevin Sibley, Agricultural Engineering)

Research Projects of Agriculture Canada Research Station Personnel (Kentville)

- Evaluation of lowbush blueberry clones (Researcher: Dr. Andrew Jamieson)
- Development of seed propagated blueberry cultivars (Researcher: Dr. Andrew Jamieson)
- Performance of micropropagated planting stock (Researcher: Dr. Andrew Jamieson)
- Improvement of micropropagation techniques and media (Researcher: Dr. Andrew Jamieson)
- Studies to determine the protectant and post-infection activity of the fungicide triforine (Researcher: Dr. Paul Hildebrand)
- Etiology of leaf spot and leaf gall diseases of lowbush blueberry caused by Exobasidium (Researcher: Dr. Nancy Nickerson)

- Taxonomy of Exobasidium species causing red leaf disease of lowbush blueberry (Researcher: Dr. Nancy Nickerson)
- Contact and residual toxicity of selected organophosphate insecticides to blueberry maggot (R. mendax) adults (Researcher: Dr. Sonia Gaul)
- Persistence and efficacy of selected dimethoate organophosphate insecticide sprays in vegetative and fruit bearing fields (Researcher: Dr. Sonia Gaul)
- Testing of blueberry volatiles obtained by different processes as attractants for blueberry maggot adults and use of volatiles in controlled release systems (Researcher: Dr. Sonia Gaul)
- Blueberry multiresidue study of samples from fields unsprayed, and sprayed, and from normal processing line run: A) at beginning of process; B) at end of line; C) after 6 months frozen storage (Researcher: Dr. Sonia Gaul)
- Study to examine the major constituents of lowbush blueberry fruit that influence fruit quality (Researcher: Dr. Willy Kalt)
- Study to examine the impact of frozen storage on the retention of flavor volatiles in IQF berries (Researcher: Dr. Willy Kalt)
- Development of postharvest quarantine treatments for the Blueberry Fruitfly *(Rhagoletis mendax)* e.g. CO_2, gamma-irradiation, temperature (Researcher: Dr. Robert Prange)
- Determination of the effects of temperature, controlled atmosphere (high CO_2 and/or low 0_2), and humidity (sweating) on postharvest quality (Researcher: Dr. Robert Prange)
- Evaluation of the importance of calcium in maintaining firmness and reducing postharvest disease (Researcher: Dr. Robert Prange)
- Introduction and evaluation of handling and packaging technology, e.g. electronic colour sorting, forced-air cooling, packaging containers (Researcher: Dr. Robert Prange)
- Spoilage by microorganisms in wild blueberries with particular emphasis on heat resistant molds. This is a collaborative agreement between Agriculture Canada, Oxford Frozen Foods and Acadia University (Dr. Eric Jackson)
- Methodology of development of qualitative evaluation of wild blueberries (Researcher: Katherine Sanford)
- Moss separation in blueberry processing (Researcher: Richard Lawrence)
- Juice extraction (Researcher: Richard Lawrence)
- Juice clarification (Researcher: Richard Lawrence)
- Modified atmosphere packaging of blueberries (Researcher: Dr. Robert Stark)
- Pre-process handling (Researcher: Dr. Robert Stark)
- Collaboration with Dr. Kalt on the effect of different packaging methods on the quality of frozen blueberries (Researcher: Dr. Robert Stark)

Other Lowbush Blueberry Research

- Improving Lowbush Blueberry Pollination in Nova Scotia (Researcher: Dr. Rick Fisher, Acadia University, Wolfville, N.S.)

- Phenology of the Blueberry Leaf Tier (Researcher: Dr. W. Seabrook, et al., University of New Brunswick, Fredericton, N.B.)
- Use of Bee Attractants to Increase Pollination in Lowbush Blueberry (Researcher: J. Hoyle, N.S. Agricultural College, Truro, N.S.)
- Effects of irrigation on blueberry yields (Researcher: Dale McIsaac, N.S. Dept. of Agriculture & Marketing, Nappan, N.S.)
- Effect of rolling on soil compaction and blueberry yields (Researcher: Delmar Holmstrom, Agriculture Canada, Truro, N.S.)

2.5 VEGETABLE CROPS

By Charles N. Thompson, Vegetable Specialist

2.5.1 OVERVIEW

Vegetables (including potatoes) are among the most valuable cash crops produced on Nova Scotian farms. Over 80 million kilograms of these crops are consumed by Atlantic Canadians. Five thousand hectares of vegetable crops produce gross farm revenues of over 15 million dollars for 150 commercial growers. The retail value of this food is in excess of 50 million dollars.

In dollar value terms 60% of vegetables are marketed to processors and 40% to the fresh market. The main processing crops are: Potatoes for potato chips, carrots (frozen sliced or diced products), peas (green frozen or canned) and snap beans (frozen or canned). There are 3 major processors: Hostess Fritolay, Cobi Foods and Oxford Frozen Foods. Of the 40% fresh, 25% is marketed directly to retail stores, through roadside markets, farmers markets and small processors (mainly cabbage for kraut and coleslaw), 15% is marketed to wholesalers of the major chain stores (Bolands, Clover Produce, Atlantic and Coop Atlantic).

A large variety of crops can be grown (over 50 types) but production is strongly seasonal. Crop volumes are highest between July 1 and October 31. Some crops are held in cold storages for up to 8 months such as potatoes, cabbage, rutabagas and carrots. All vegetables processed with the exception of potatoes are on a seasonal basis.

Within the province 70% of the vegetables are grown in Kings County, 25% are grown in Cumberland, Annapolis, Colchester, Cape Breton and Pictou Counties.

Vegetables are labor intensive crops in the many phases of production, processing, packaging and marketing. Over 2000 people depend on vegetable crops for a significant part of their income. Many more people supply growers with goods and services needed for producing and marketing these crops.

The Vegetable and Potato Producers Association of Nova Scotia is the commodity group working for Nova Scotia growers and consumers of their products. Nova Scotia grown vegetables mean good value for the dollar, high quality and high nutrition. The local production of vegetables also provides a degree of food security especially with processed crops and crops in cold storage. Less than 40% of the vegetables consumed by Nova Scotians are produced within the Province.

2.5.2 VEGETABLE REPORT

Acreage 12,285 — an increase of 55 acres from 1990. Value of production at least 15.0 million dollars (an increase of 1.6 million dollars from 1990) at the farm gate — from a marketable production of 148.3 million lbs (approximately the same as in 1990).

Crop yield and quality were surprisingly good considering the extremes in the weather but market prices were low due to a lack of earliness in crops followed by low market prices throughout the rest of the growing season.

April and early May got some crops off to a good start but two May frosts (freezes on May 19 and 23) burned off early potatoes and sweet corn as well as damaging early cole crops. Most of these crops recovered but earliness of these crops was delayed and quality reduced.

Dry weather from late-May to mid-August reduced the germination of many crops leading eventually to oversized and unevenly sized product as well as reduced yields and quality. The use of irrigation was extensive since the drought was one of the most severe this century. This meant high cash input costs for fuel and labor for irrigation.

Moist weather after mid-August promoted fast growth but in some crops such as rutabagas and carrots excessive oversizing and consequently marketing problems resulted. Cole crops, which had been poor in 1990 due to insect pests such as Diamondback Moth, were almost free of the pest this year due mainly to climatic differences between the seasons. Over 100 acres of potatoes were not harvested due to wet fields in October and November. Many crops were harvested late and it was fortunate that warm weather persisted since

Table 2.19: Estimated Vegetable Production in Nova Scotia in 1991

CROPS	ACRES	YIELDS LB/AC	TOTAL LBS	PER LB RETURN	TOTAL FARM RETURN
Potatoes	4,300	18,558	79,800,000	.07	5,586,000
Beans, Baking	100	1,000	100,000	.80	80,000
Beans, Snap	1,200	3,571	4,285,330	.10	428,533
Beets	105	10,000	1,050,000	.10	105,000
Broccoli	385	5,000	1,925,000	.35	673,750
Cabbage	405	25,000	10,125,000	.10	1,012,500
Carrots	1,390	16,763	23,300,570	.08	1,864,046
Cauliflower	205	11,000	2,255,000	.32	721,600
Corn, Sweet	750	3,500 500 doz	2,675,000 (375,000 doz)	1.50/doz	562,500
Cucumbers	105	10,000	1,050,000	.18	189,000
Lettuce	230	15,000	3,450,000	.15	517,500
Onions, yellow	95	22,000	2,090,000	.12	250,800
Peas	1,925	1,627	3,131,975	.18	563,756
Rutabagas	410	15,000	6,150,000	.12	738,000
Squash/Pumpkin	305	10,000	3,050,000	.07	213,500
Tomatoes	90	15,000	1,350,000	.50	675,000
Specialty Crops	285		2,500,000	.35	875,000
	12,285		148,287,875		15,056,485

harvest occurred up to early December.

The roadside marketing sector performed quite well this year. It continued to upgrade outlets and add a few well placed markets. Farmers Market development was more static.

In the processing vegetable sector, Cobi Foods continued to restructure in Nova Scotia and in Ontario. In Nova Scotia pea and bean (snap) processing crops had disappointing yields which were slightly less than in 1990 due to the drought. Oxford Frosen Foods had problems with a lack of germination in carrot fields which translated to excessively large sized carrots for slicing by mid-September (also due to the tremendous growth from rainfall during the mid-August to mid-September period).

Wholesale marketings were negatively affected by the drought and consequent problems in quality. These factors also meant low amounts of early marketings (extremely low in July) but through the rest of the crop year and storage Nova Scotia produce captured a large share of the Nova Scotia market. The first vacuum cooled product reached the market this year (mainly lettuce). Extremely low wholesale prices have again discouraged producers in this sector. Direct marketing to retail stores and to cabbage processors (cole slaw and kraut) is still important to the vegetable industry and producers in this sector seem reasonably optimistic about the future.

Due to low vegetable prices growers are trying to survive and develop by improving their efficiency, the quality of their product and considering their mix of marketing options.

Table 2.20: Specialty Crops

	ACRES	YIELDS LB/AC	TOTAL LBS
Spinach	87	1,500	133,500
Parsnips	40	10,000	400,000
Rhubarb	20	13,000	260,000
Peppers	20	10,000	200,000
B. Sprouts	20	5,000	100,000
Asparagus	15	1,000	15,000
S. Savory	15	500	7,500
Melons	15	20,000	300,000
Chinese Cabbage	10	15,000	150,000
Green Onions	10	10,000	100,000
White Endive	5	5,000	25,000
Parsley	5	15,000	75,000
Garlic	5	1,500	7,500
Celery	5	30,000	150,000
Radish	5	5,000	25,000
Leeks	5	10,000	50,000
Ginseng	1	2,000	2,000
Total Specialty	285		2,500,000

Other Herbs, Kohlrabi, Broad Beans, Gourds, Indian Corn, Eggplant, Endive, Swiss Chard, Fiddleheads, Mushrooms, Celeriac

Table 2.21: Estimated Nova Scotia Vegetable Crop Area Planted in 1991

VEGETABLE	VEGETABLE AREA		CHANGE FROM 1990	
	Hectares	Acres	Hectares	Acres
Potatoes	1741	4300	81-	200-
Beans, Baking	40	100	0	0
Beans, Snap	486	1200	0	0
Beets	43	105	2+	5+
Broccoli	156	385	2-	5-
Cabbage	164	405	20-	50-
Carrots	563	1390	6-	15-
Cauliflower	83	205	2+	5+
Corn, Sweet	304	750	8+	20+
Cucumbers	43	105	2+	5+
Lettuce	93	230	0	0
Onions, Yellow	39	95	8+	20+
Peas	779	1925	103+	255+
Pumpkins & Squash	124	305	0	0
Rutabagas	165	410	0	0
Tomatoes	36	90	8+	20+
*Specialty Crops	115	285	2-	5-
	4974	12,285	22+	55+

Source: Statistics Canada information where it is available and estimates of the Vegetable Specialist.
* Includes processing acreage.

** Spinach (87), Parsnips (40), Rhubarb (20), Peppers (20), Brussel Sprouts (20), Asparagus (15), Summer Savory (15), Melons (15), Chinese Cabbage (10), Green Onions (10), White Endive (5), Parsley (5), Garlic (5), Celery (5), Radish (5), Leeks (5), Ginseng, Chinese Vegetables, Swiss Chard, Kohlrabi, Broad Beans, Gourds, Indian Corn, Eggplant, Other Herbs.

2.5.3 POTATO REPORT PART I

With the PVY^n problem in P.E.I. seed potatoes (Nova Scotia's traditional seed source) more seed had to be obtained in N.B. and in other potato producing areas.

The season started well up to May 19 and 23 when extreme frosts (or freezes) occurred (down to -10°C at ground level). This burnt off plants in many early fields that were not protected by irrigation systems or by hilling. This resulted in reduced crop earliness for many growers. June was favourable for emergence and growth.

Excellent stands were evident in late June. The dry weather of June continued into July and August (one of the driest periods of this century) which meant a record amount of irrigation applied to the 1991 crop. The crop set was light and harvest was 10 days later than anticipated. The quality of the early potatoes was good and skin set was improved from previous years.

The price on early potatoes was a bit stronger than in 1990 so returns were steady with 1990. The price of processing potatoes is determined by the spot market from mid-July to the first of September. Returns, then, were steady here as well.

Wet conditions set in by mid-September after a month of excellent moisture distribution. Wet weather fouled harvesting operations and delayed harvest in some fields up to late November. Over 100 acres of potatoes were not harvested due to the wet field conditions. The excess moisture also stressed potato tubers and led to some storage management problems.

PVY^n also led to destruction of approximately fifty acres of processing potatoes. Due to the light set on chip cultivars and all the stress conditions 1991 was a difficult year. Acreage in chip stock was reduced by approximately 15% due to market conditions. Due to the low yields, however, storage stocks will not be adequate to last to the new crop in July 1992. (Chipping quality has not been as high as desired due to low specific gravity and oversized tubers of "Norwis").

2.5.4 POTATO REPORT PART II

Nova Scotia 1991 Potato Crop Year

Total Crop

4,300 acres (approximately 50 growers)
18,558 lb/acre
79,800,000 lbs.
.07 per lb. (processing contract price - Sept. 1 onward approximately .07 per lb. plus storage costs).
$5,586,000 gross return at the farm gate

Potato Area

4,300 total
1,500 early and countpack
2,617 potato chips
183 seed

Seed Potatoes

5 growers
49 fields (passing inspection - mainly Norchip, Norwis and Superior plus small lots of 10 other cultivars).
183 acres (passing inspection)

Potato Chip Cultivars (Hostess Fritolay only processor)

Field run 60% Superior - July 15 start
40% Atlantic - Oct. 15 finish

Storage 40% Norchip
40% Norwis (high yielding but scab susceptible)
10% Monona
Atlantic
10% Other (Sommerset, Kanonna, Niska, A.C. Nova Chip
FL1207, FL1533 and Stuben)

Early & Countpack Cultivars

Superior 90%
Other 10%
Russet Norkotah, Conestoga, Yukon Gold, etc.)

Early Market Packs

5, 10, 20 & 50 lb. packs
mainly 5 and 10 lb. packs are sold in Nova Scotia and Newfoundland

Early Count Pack Potatoes

Only 2 major operations "Superior" mainly followed by "Russet Norkotah".

Pest Problems

- Colorado potato beetle pesticide resistance noted on farms with early potatoes and little rotation.
- Scab problems due to "Norwis".
- No late blight problems this year.
- Granular insecticides are not being used.

2.5.5 HIGHLIGHTS OF 1991 YEAR

- Early retirement programs took most of the vegetable staff at the Kentville Research Station and some provincial staff, eg. Dr. L. Ricketson, E. Thorpe, Dr. H. Specht and Tom Haliburton. The loss of these experienced and respected personnel have changed the direction of Research and Extension work with vegetable crops. Hopefully at least 3 positions similar to those lost will be filled by late 1992.
- Cultivar Testing Projects organised — Vegetable and Potato Producers of Nova Scotia and the Nova Scotia Department of Agriculture & Marketing along with CDI and AFDA funding. Mark Butcher (Minas Crop Care) involved as a Private Consultant for field and vegetable crops. Mary Jansen was hired by the VPPA of NS and CDI on special cultivar testing on farm.
- More farm calls were made outside of Kings County and more field scouting was done (due to M. Butcher's services).
- First vaccum cooler in the Atlantic area is located in the Canning area (cooling mainly lettuce, sweet corn and cauliflower).
- Challenge to supply management system could hurt the vegetable industry since most vegetable growers are in at least one supply managed commodity.
- Generally, quality of product continued to improve on all markets.
- Lack of profitable rotation crops.
- Projection for more direct to retail chain store sales vs wholesale market. Roadside markets continued to upgrade facilities.

- Irrigated acreage continued at highest level in history of NS industry.
- Expansion of yellow onion production.
- Stabilisation of Cobi Foods financial situation.

EXTENSION PROGRAM:

General:

1. Soil Sample Recommendation — 1000 samples
2. Phone & Consultations and Letter — 1000
3. Policy Activities
   (a) Agri-Food Development Agreement - Vegetable Committee
   (b) Seed Potato Policy
4. Advisory Support to V.P.P.A. of Nova Scotia
5. Vegetable Specialist Library
   Vegetable Specialist Crop Files
   Vegetable Specialist Audio Visual Files
   Vegetable Specialist Grower Files
   Vegetable Specialist General Files
   Vegetable Specialist Research Files
6. Media Contacts
7. Publication Preparation (general)
8. Farm Calls 200
9. Crop Reports

PUBLICATIONS:

1. Vegetable Newsletter - 12 editions in 1991.
2. Potato Newsletter - 1 edition.
3. ACC Home Garden Publications under revision.
4. Grower lists prepared and estimated 1991 vegetable production.
5. Potato Guide – Pub 1300A distribution.

EXHIBITIONS – JUDGE VEGETABLES:

1. Hants County,
2. Pictou County,
3. Cumberland County

SPECIAL PROJECTS

1. Vegetable Legume Crop display Atlantic Winter Fair
2. Cultivar Trials (on farms and in plots)

RESERACH & DEMONSTRATION PROJECTS:

1. Cultivar Trials (on farm)
2. Eastern Canadian Dry Bean Trial
3. Tunnel House Pepper & Eggplant Production
4. Red Cabbage Cultivar Trial
5. Lettuce Cultivar Trial

2.6 MAPLE

D.W. McIsaac, Horticulturist

2.6.1 OVERVIEW

1991 PRODUCTION

Number of producers:	62
Number of taps:	246,900
Pure maple syrup produced:	80,000 litres
Average return to producer:	$8.56/litre
Farm gate worth:	$685,000
"Other" pure maple products made:	13,685 kg

The 1991 maple season in Nova Scotia was the poorest in terms of yield since 1987. It was also the fourth poorest yield in the past eighteen years.

Eighty-two (82) percent of the maple syrup produced in 1991 was sold as syrup. The remaining eighteen (18) percent was used to make 13,685 kg of "other" pure maple products such as maple cream, soft and hard maple sugar, maple butter, granulated maple sugar and maple jelly.

The colour and flavour of the maple products was very good.

PRODUCTION AVERAGES

Period	Average Annual Production in Nova Scotia (litres)
1960-64	18,002
1965-69	24,184
1970-74	28,085
1975-79	42,323
1980-84	59,543
1985-89	71,827
1990-91	86,597

2.6.2 MARKETING

Most of the 1991 crop of maple syrup has been sold by Nova Scotia producers. The Maple Co-operative of N.S. Limited did however have approximately 9,000 litres on hand at year end. MCNS has been using this inventory to develop markets, both in Nova Scotia and overseas, and it is not a cause for concern.

The situation is not the same in all maple producing areas. In Quebec, by far the largest producing area, approximately 12,000,000 litres of syrup is now in inventory. That amount of syrup has built up over the past three seasons, and is equal to the world consumption of maple syrup in one year.

The prices received by Nova Scotia producers for their maple products in 1991 were much the same as prices received during the past four or five years. However, costs have continued to increase.

2.6.3 EXTENSION ACTIVITIES

Maple Co-operative of N.S. Limited

- A Marketing Co-ordinator was hired in April.
- Over 11,360 litres of syrup were brought to the MCNS facility in May. The syrup was weighed, graded, and placed in cold storage.
- The Grand Opening was held in December.
- A logo and label were developed for MCNS.
- Potential markets were explored within Nova Scotia and overseas.
- A promotion program was planned and implemented.

Maple Producers' Association of Nova Scotia

- The Maple Festival of Nova Scotia was planned, scheduled, and promoted. Events were held during March and April.
- The Fall Maple Tour was held in October in the Leamington and Rodney areas of Cumberland County.
- The Annual General Meeting was held on January 25th at the Nova Scotia Agricultural College in Truro.
- A promotion program was planned and implemented in Nova Scotia.
- Plans were made to host the North America Maple Syrup Council Meetings in Truro in October, 1993.

Maple Products Policy: 1990-91

- Number of Applications assessed: 25
- Number of Applications approved: 18
- Total Grants paid out: $45,372.81

2.6.4 GENERAL EXTENSION

The Maple Specialist provided:

- Assessments of potential maple woodlots.
- A consultation service to producers and potential producers about all aspects of sugar woods management, production practices and marketing.
- Information through the Maple Newsletter and Maple Fact Sheets.
- Interviews with the media.
- Lectures and field trips to participants in Nova Scotia Agricultural College Farm Woodlot Course; Nova Scotia Agricultural College Plant Science Course and a Lyceum on the environment.

2.6.5 CONCERNS

The huge surplus of maple syrup has built up over the past three years in Quebec. Approximately 12 million litres or what the entire world uses for maple syrup in one year remains in storage heading into another producing season. How will this surplus affect the markets for pure maple products and the prices that Nova Scotia producers receive for their products?

The survival and viability of the Maple Co-operative of N.S. Limited remains uncertain. If MCNS overcomes its organizational difficulties and develops new markets both overseas and locally, Nova Scotia production will be able to continue at the present rate and most likely will be able to increase. However, if MCNS problems persist, the viability of the Nova Scotia maple industry will be in doubt.

Chapter 3

GREENHOUSE, ORNAMENTALS, HOME GARDENS

3.1 GREENHOUSE

By Brian Toms, Horticulturist
Beverly MacPhail, Horticulturist
Arthur Haskins, Technician
Kim Best, Technician

3.1.1 OVERVIEW

The 1991 crop year for producers of both greenhouse vegetables and bedding plants was an improvement over 1990 as demand and prices were better.

Greenhouse vegetable growers who had suffered from low demand, low prices and in some cases poor crops in 1990, were able to make good their losses for that year. Crops were generally very good and better co-operation amongst growers and retailers made for a successful spring crop. Fall crops were few and in many cases barely covered production costs. It is likely that growers will concentrate on spring cropping and will further reduce the fall crops in the future.

The bedding plant growers had better weather at selling time which increased demand considerably. There was, however, a serious problem with a major supplier of growing compost, which led to poorer than usual crops for a number of producers.

Increased levels of imports of cut flowers and declining profit margins for these crops and for potted plants such as poinsettias resulted in financial problems for a major producer of these crops. This will probably lead to some downsising in the area devoted to cut flower production in Nova Scotia. If this space is used for alternate crops, this may result in pressure on other areas of greenhouse production, such as bedding plants or greenhouse vegetables.

In 1991, an increase was seen in the number of enquiries from people interested in building greenhouses. Most of the interest was for small part-time operations growing bedding plants and vegetable transplants for local sales. This could result in some disruption of established markets in the coming years.

Increasing use of new technology has allowed many established growers to improve production efficiency and lower labour costs. Better pest and disease control resulted in fewer problems in 1991. Biological control of insect pests in greenhouse vegetable crops has gained widespread acceptance and has reduced pesticide usage considerably.

3.1.2 NOVA SCOTIA GREENHOUSE INDUSTRY STATISTICS

Sales of greenhouse products take place in all 12 months of the year, and as a result, statistics for 1991 are not available at the time this report was prepared. Figures for 1990 are included and are taken from Agriculture Canada's greenhouse industry survey. This survey is limited to operations of 700 m^2 and above, and consequently a large number of smaller operations are not included.

Table 3.1: Industry Statistics

	1988	1989	1990
Greenhouse area	177,118 m^2	165,940 m^2	190,116 m^2
Total Sales	$17,719,740	$16,425,358	$18,736,582
Sales/m^2	$100.04	$98.98	$98.55
Number of Producers Reporting	44	38	49
Number of Employees	803	822	872
Payroll	$5,977,079	$5,946,126	$6,867,800
Industry Investment	$21,817,000	$21,226,000	$22,250,000

Table 3.2: Flower and Plant Producers

	1989	1990
Greenhouse area	142,000 m^2	151,000 m^2
Sales	$14,620,000	$16,392,000
Number of Producers Reporting	30	37
Sales/Grower	$487,333	$443,027

Table 3.3: Vegetable Producers

	1989	1990
Greenhouse area	35,000 m^2	37,000 m^2
Sales	$1,925,500	$2,345,000
Number of Producers Reporting	13	15
Sales/Grower	$148,115	$130,278

3.1.3 COMMODITY REPORTS

Flower Crops

Chrysanthemums and cut roses are the major cut flowers produced in Nova Scotia Greenhouses at Avon Valley Greenhouses, Falmouth; Scotia Greenhouses, Woodville; and Gordon's Greenhouses at Oxford. Rose production appears to be profitable at this time, however the economics of cut chrysanthemums production are causing concern and it is possible that imports of chrysanthemums will increase the expense of local production.

Competition is increasing from cut flowers grown in Holland and South America. Carnations, chrysanthemums, florist greens, and many specialty cut flowers are brought in by cut flower growers and brokers for resale to the retailers.

Avon Valley Greenhouses have increased their rose production in the soilless growing technique, rockwool. They are also investigating growing roses in a hydroponic growing system using clay particles as a rooting medium. They have a new packing line for their roses, which has increased flower quality and marketing efficiency.

Potted Plants

These crops include flowering pot plants, e.g. poinsettia, pot chrysanthemums, azaleas, and Easter lilies, some grown on a year round program and others for specific holidays. Tropical foliage plants are also grown in pots for sale throughout the year.

Demand for foliage plants remains steady, however production of flowering potted plants has increased with enhanced interest in smaller sized plants sold mostly through chain store outlets.

Poinsettia production continues to increase with the introduction of locally produced rooted cuttings and the new varieties now available. Price competition has limited returns to producers, however, there is still a strong interest in this crop with several growers interested in biological control of the major pests and most growers using differential temperature regimes rather than growth regulators to control plant height.

Bedding Plants

The greenhouse area used for bedding plant production expanded marginally in 1991 and together with greater use of plug growing techniques, resulted in increased production for the year. This combined with favourable weather during the peak selling season in late May and early June made 1991 a successful year for many bedding plant producers. However, problems with a widely used growing compost (resulting in slow growth and poor quality plants), were experienced by approximately twenty growers, causing considerable concern during April and May and a serious loss of income to those affected.

During the year, there was a marked increase in the number of enquiries from persons considering entering the bedding plant growing business. This was partly due to increasing interest in small business opportunities by people looking for employment.

Greenhouse Vegetable Crops

Producers of greenhouse grown tomatoes and cucumbers reported a good year with better than average yields and prices for the 1991 spring crop. Fall crops were less profitable and most growers will only be growing spring crops in future.

Disease problems were much reduced, however, both pythium root rots and gummy stem blight caused some losses in cucumbers. Biological control of greenhouse pests were used successfully in many places and only one severe infestation of greenhouse white fly was recorded.

Hydroponic and other soilless growing systems continue to be used by most producers and one grower who converted to a rock-wool growing system reported excellent growth and record yields for tomatoes but some problems with pH control in his cucumber crop.

Greenhouse lettuce production in 1991 was reduced as one operator ceased production of this crop.

The Greenhouse Growers' Association of Nova Scotia

The Greenhouse Growers' Association of Nova Scotia (G.G.A.N.S.) held two general meetings, seven director's meetings and were involved in several projects. Jackie Allen resigned from the position of Marketing Co- ordinator for the G.G.A.N.S. and was replaced by Deirdre MacCormac. The Marketing Co-ordinator works on the promotion of the greenhouse industry, education of the general public on greenhouse products and communication within the greenhouse industry. The G.G.A.N.S. participated in the Garden and Patio Show and several other promotions at Malls and Fairs. The G.G.A.N.S. developed new television commercials promoting their products, written promotion material and expanded the photograph collection. The G.G.A.N.S. hired Deloitte and Touche for a bedding plant cost of production study with funding from the Human Resource Program of A.F.D.A..

There has been considerable interest from Association members in bulk purchasing, so the G.G.A.N.S. initiated a study of the feasibility of bulk purchasing greenhouse items and services.

The study will list potential items for bulk purchasing and suggest several options for organising bulk purchasing.

The G.G.A.N.S. were also asked by the members to investigate the establishment of a Marketing Board for Bedding Plants. Several options for the different powers a marketing board could have were presented at the spring growers meeting. A follow-up telephone survey was done in the summer to determine the grower interest in a marketing board. The results presented at the fall growers meeting indicated the majority of bedding plant growers were not in favour of a marketing board.

The Greenhouse Growers Association held a day information and education session on March 7, 1991 in Truro and a two day education session September 18–19, 1991 in Coldbrook.

Nova Scotia Greenhouse Vegetable Marketing Board

The Greenhouse Vegetable Marketing Board appointed Paul Eyking as Co- ordinator of Board Operations. Marketing difficulties were less in 1991 when compared with 1990, and co-operation with retailers (notably Sobeys) was much improved. The exchange of market information between producers was facilitated by the appointment of the co-ordinator and this in turn led to better distribution of tomatoes and cucumbers to the retail market. Better advertising and in-store promotions were also beneficial in increasing sales and maintaining good price levels.

Increased public awareness of Nova Scotia greenhouse vegetables will continue to be a priority for the board in 1992 and the advertising and other promotions will be expanded with the use of a portion of the funds received from the Federal Stabilisation Program for the 1990 crop year.

3.1.4 GREENHOUSE EXTENSION TRAVEL

Professional Plant Growers Association Tour – New Zealand (Oct. 28–Nov. 15, 1991)

Submitted by: Bev MacPhail, Horticulturist

The Professional Plant Growers Association (P.P.G.A.) is an International Trade Association for the greenhouse industry, which serves growers of greenhouse crops, as well as members of related industries. They sponsor an annual trade show and conference, an educational newsletter, promotional material, international tours, and a research foundation. I was very fortunate to attend the educational tour sponsored by P.P.G.A. to New Zealand, October 28–November 15, 1991. The tour focussed on bedding plant operations, nurseries, garden centers, botanical gardens, educational and research centers, and the outstanding scenery New Zealand has to offer.

New Zealand

New Zealand consists of two islands, North Island is 115,000 km^2 and South Island is 151,000 km^2, with a total length of 1600 km, situated 1700 km south of Fiji and 2250 km east of Australia. Only 3.5 million people live in New Zealand, with the population concentrated on North Island, due to the climate. One million people live in Auckland, the largest city. Auckland has several frosts a year, a sub-tropical climate, while the southern slopes along the west coast of South Island remain snow covered year round. The landscape changes dramatically from areas which receive 6 metres of rain a year and soaring green mountains to drought areas.

Agriculture

Agriculture is based on exports, which traditionally were lamb and beef sent by refrigerated ships to the U.K.. With the U.K. in the Common Market, they have been forced to develop new marketing strategies. There are 60 million sheep in New Zealand with the best land supporting ten sheep per acre. Dairy cows are outside year round on pasture feed, which accounts for a very low input cost for milk production. Deer and elk farming is very popular for velvet sales to the Asian market and meat production. Kiwi fruit is still a major export item, however, the returns to the growers are much lower than the first Kiwi growers who did very well. There is strong competition from Italy, Spain, and California for the Kiwi market. New Zealand has an excellent climate for grapes and they produce some very good wine.

The general economy is struggling in New Zealand and the general impression is, farmers are having difficulties. Government services have been cut back and I believe their research branch was in an upheaval with very low morale.

Ornamental Horticulture

Ornamental horticulture thrives in New Zealand, you have the feeling they can grow anything. The retail sales value for ornamental plants is $150 million per year. There is a strong interest in home gardening, which is evident in Auckland, a city of one million people supporting 80 garden clubs. The export of cut flowers is increasing from $5 million dollars in 1988 to $20.7 million in 1990. They are targeting the Japanese market. They have a wide diversity of plant material with new selections often made by amateur breeders.

Greenhouses, Garden Centers, Botanical Gardens, Universities

We toured greenhouses, garden centers, botanical gardens, nurseries, and private gardens. I have selected a few highlights.

The Auckland Botanical Garden is 65 ha situated in the middle of a residential area and is only ten years old. The staff have involved the public, ornamental industry, university, and extension staff in the garden activities. Volunteers run a gift shop, answer gardening questions, work in the library, and raise money. There are three evaluation panels of extension staff, nursery growers, and home gardeners, who provide input to the gardens and assist in producing publications. The general public attend guided rambles on weekend mornings and vote for their favorite rose during rose weekend.

Nga Rakau Nursery is a family run bedding plant and garden centre operation. Mike Struthers, the owner's son, has attended bedding plant conferences and visited operations in the United States. He has adapted many new techniques and equipment seen on his travels to their bedding plant operation. They grow plug annuals for other growers. Their greenhouses have bench or bottom heat for germination but have minimal or no heat for growing on.

Ray Harrop, Hawke's Bay, developed an interesting technique for growing shorter and sturdier tomato seedlings, which he grows on contract for a canning company. He sows directly into a 273 plug tray with the tomato seedling ready to plant outdoors in five weeks. He brushes the plants with a 60 cm ABS pipe, which is rolled over the tomato plants every 30 minutes, 20 times a day. The pipes are suspended at crop height using a system similar to a water cart, motor driven and controlled by a time clock. There has been research to indicate movement of plants will keep them shorter.

Eddie Walsh, Floriculture Professor at Massey University, was our tour guide in the Palmerston North area. He is paid five months of the year for his teaching responsibility and does industry supported research, bedding plant trials and promotional work. Each of his students has a space in the greenhouse, in which they try to maximise their production for a sale at the end of the year. They must record the cost of

materials, plants, as well as their time for a friendly competition for highest returns received from the plot. Eddie Walsh works on new crop development, bedding plant trials and promotional work for the industry. The New Zealand Nurseryman's Association promoted white petunia, blue salvia, and red begonia for a red, white, and blue bedding plant promotion, celebrating New Zealand's 150th Anniversary. Eddie assisted in this promotion by selecting the very best varieties from his trials and making suggestions for use in gardens.

The people we met in the bedding plant ornamental industry treated us very well and kept us overfed. My overall impression of New Zealand is that anything can flourish and they have a huge range of ornamental plants to select from.

3.1.5 GREENHOUSE EXTENSION PROGRAM

Information Meetings

Speakers were obtained for the educational programs of the Greenhouse Growers' Association of Nova Scotia meetings. Meetings were held in March and September of 1991.

A tour of growers and an evening information meeting was held in Cape Breton on May 2nd.

Several home garden meetings were attended and programs presented at these meetings.

Short Courses

A short course on the production of oyster mushrooms was held at Truro, March 11–15, 1991. Brian Toms participated in several sessions of this course. The bedding plant production short course was not offered this year.

Regional Horticultural Conference – Hort East

Hort East was established in 1991 to organize an Atlantic Horticultural Conference and Trade Show for the greenhouse growers, landscapers, nursery growers, lawn care operators, garden centre operators, and greenhouse vegetable growers. Landscape Atlantic and the Greenhouse Growers Association of Nova Scotia are the two co-sponsors with support from the New Brunswick and Nova Scotia Department of Agriculture. The Hort East Conference will be held January 10 – 12, 1993 at the World Trade and Convention Centre, Halifax, Nova Scotia. There will be a concurrent educational program and an 80 plus booth trade show.

Members of the Hort East '93 Steering Committee are as follows:

Mary Brown	-	Chairperson
Paul Matheson	-	Landscape Atlantic
Sandy Roberton	-	Landscape Nova Scotia
Ben Scholton	-	Landscape New Brunswick
Chris Brown	-	Greenhouse Growers Assoc. of Nova Scotia
Jennifer Swansburg	-	Trade Show Representative
Vincent Dieras	-	Trade Show Representative
Bev MacPhail	-	N.S. Dept. of Agriculture & Marketing

Consultations and Information Services

The dissemination of information to growers by telephone, correspondence, and personal visits is a major part of any extension service. Growers in all counties of Nova Scotia were visited in 1991 and information provided on all facets of greenhouse production. A newsletter was also produced periodically to update growers on recent developments within the industry.

Committees and Meetings

Numerous committee and other meetings were attended including:

- Agricultural Institute of Canada Meeting, Fredericton.

- Canadian Society of Horticultural Science, Summer Tour, New Brunswick.
- Summer meeting of A.C.C.'s Advisory Committee on Greenhouse and Ornamental Crops, Fredericton.
- Annual Meeting of Advisory Committee on Greenhouse and Ornamental Crops - Memramcook, N.B. in November.
- Bev MacPhail served as President for the Nova Scotia Institute of Agrologists for the year 1991 – 1992.

3.1.6 RESEARCH AND DEMONSTRATION PROGRAM

A number of research and demonstration projects were conducted by section personnel during the year. These included:

1. An All American Display Garden, featuring the newest bedding plant cultivars awarded the All American Selection designation.
2. Two evaluation trials on bedding plant cultivars.
3. Statice cultivars and other dried flowers were evaluated in two trials.
4. Production schedules for flowering garden mums for Mother's Day were investigated and a large trial of fall flowering cultivars was also conducted.
5. A flowering kale and cabbage cultivar evaluation.
6. Two trials on the use of Bacillus thuringiensis for the control of fungus gnat larvae on greenhouse ornamentals.
7. Cultivar evaluations on both tomato and cucumber cultivars.
8. Modified hydroponic growing systems were developed and trialed for both greenhouse tomatoes and cucumbers.

Details of the above projects are contained in the Plant Industry Branch Project Report, Publication for 1991.

In addition to the projects conducted by Section Staff, a number of co- operative projects were carried out with researchers for the N.S. Agricultural College and the Federal Agriculture Research Station at Kentville. The studies being conducted by Dr. J.P. LeBlanc (N.S.A.C.) into the monitoring and control of western flower thrips in greenhouse crops are of great importance for producers in the province.

3.2 HOME GARDENS

By Myrna J. Blenkhorn, Horticulturist

3.2.1 OVERVIEW

Most shrubs and trees came through the winter with little winter damage which was remarkable with the small amount of snow cover early in the season. Spring warmed up quickly and the season was 10 days ahead of normal by mid-May.

Spring started out relatively dry which resulted in a drought by July and August. The rain started in August and by the end of October many soils were saturated.

With the dry season we saw less foliar disease problems than normal but aphids and mites were serious on many plants. Drought stress was found on many large trees such as maple, oaks and some evergreens. Some of this drought stress was compounded with damage from the drought in 1990.

A late spring frost damaged ash, oak, all nut trees and balsam fir which were in the budding out stage. All of the trees leafed out again in the season but this damage may carry over for another season with reduced growth. Some early planted gardens were also frosted and had to be replanted.

Many vegetable gardens were affected by the drought as those planted in June had germination problems. Soil moisture was limited and seed germination was greatly reduced unless irrigation was applied. Other problems which were attributed to the drought were blossom end rot of tomato — a physiological problem related to water and calcium uptake and potato scab.

Some of the insects which caused problems were willow flea weevil, alder leaf beetle, strawberry weevils (in houses) and ants, wasps and hornets.

Chinch bugs destroyed many lawns throughout Nova Scotia. As in 1990 some of the damage was confused with drought symptoms. By the end of July most lawns were brown from drought stress and then started to green up from the rains that occurred at that time. I feel that the chinch bug was also affected by the drought and the eggs didn't hatch until the moisture level was favourable. This appeared to occur near the end of July and the new green grass was an easy target. Lawn care companies and home owners were kept busy trying to protect or salvage their lawns. Many of these lawns were also attacked in 1990 and many home owners were reluctant to renovate their lawns a second year in a row.

Calls and correspondence increased in 1991 and especially by the summer. Some of this was the result of the retirements of Dick Morton and Les Blackburn.

3.2.2 NOVA SCOTIA GARDEN GUIDE

This was our 13th year for the radio series Nova Scotia Garden Guide. This series deals with specific gardening topics including insects and diseases, culture of many plants, new varieties or techniques as well as some Home Economics topics. This year the series was carried by 12 radio stations throughout Nova Scotia. The series runs for 26 weeks from mid-April to mid-October. Preparation of the information for the scripts is done in December and January before being passed on to Orville Pulsifer & Associates for the scripts to be written and voiced.

3.2.3 GARDEN COURSES AND MEETINGS

A number of gardening courses were held which I participated in: Brooklyn (annuals), Bridgewater (shrubs), Valley Gardeners (basic gardening) and Weymouth (composting). I also spoke to the Coop Atlantic Staff Training Course and the Charing Cross Garden Club in New Ross.

Other groups which I spoke to were Kentville United Church Ladies, Greenwich Ladies Group, Blomidon W.I., Darmouth Seniors and Farm Women's Day in Kings and Hants Counties.

I had the opportunity to do a bi-weekly radio spot on CJCH City Lights program through the gardening season.

I judged at a number of Science Fairs — Berwick School, Evangeline Middle School and Kings County Science Fair.

With the retirement of Dick Morton and Les Blackburn I took over some of the judging at Flower Shows — New Ross, Forties, Clare, Digby and Windsor Exhibition. Also I served as a judge at the 4H Provincial Show in Windsor.

The Garden and Patio Show is a major event to start the gardening season. This was the third year for this show and the Department was a major sponsor. The show was held on April 5 & 6 at the Metro Centre. The attendance at the show was approximately 6500 and exhibits featured all aspects of gardening and outside living. Our booth dealt with garden inquiries, composting and a theatre where gardening videos were shown.

The annual Nova Scotia Association of Garden Clubs Convention was held in Truro on June 14 & 15. Talks were given on many different garden topics.

3.2.4 COMMITTEES

I have been a member of the Exhibition Evaluation Committee for a number of years. This year the exhibitions which I visited were the Nova Scotia Provincial Exhibition in Truro and the Western Nova Scotia Exhibition in Yarmouth.

I am a member of the Education Committee of the Nova Scotia Fruit Growers Association. Some of the responsibilities of this group are the Fruit Growers museum, the Apple Blossom Dessert Contest, the float for the Apple Blossom Parade and the Golden Apple Award. This was the 10th year for the museum to be open and we celebrated with a museum tour and garden party (held inside because of the rain).

The Greenhouse and Ornamentals Committee held their annual summer tour in New Brunswick this year in conjunction with the AIC meetings. The committee also met at Memrancook in November.

3.2.5 TELEPHONE CALL-IN SERVICE

In 1991 it appeared that I spent more time than ever on the phone helping people with their garden questions and problems. One major concern this year was lawn care — chinch bugs and drought, this problem seemed to affect alot of people. The number of calls for 1991 are up considerably from 1990 — some of this can be attributed to the retirement of Les Blackburn and some from the increased referrals from the Halifax Office. The following table indicates the number for the past five years:

	1987	1988	1989	1990	1991
Kentville	2693	2731	2588	2643	3609
Truro	1550	2277	1630	1691	n/a

Correspondence increased in 1991 and the number of people coming into the office has been steady.

3.2.6 NEWSLETTERS

There were 6 issues of the Home Garden Newsletter. This is written specifically for the Agricultural Representatives and is intended to inform them of the many problems we are seeing, so that they can deal with them as the problem arises.

3.2.7 NEW PUBLICATIONS

One new publication was written "Apple Maggot Control in the Home Garden", this incorporated the use of apple maggot traps and sprays for controlling the apple maggot. This publication was written by Dick Rogers, Dr. Rob Smith and myself.

3.3 ANNAPOLIS ROYAL HISTORIC GARDENS

By Pat Pelham, Horticultural Advisor

3.3.1 WEATHER

Weatherwise, the 1991 year at the A.R.H.G. was certainly an experience. To begin with, a mild winter created favourable overwintering conditions for most perennial materials. In notably good condition was the new bed of Rosa chinensis 'Old Blush' which emerged from winter totally unscathed. Newly-planted Calluna cultivars (Heathers) frost heaved mightily but proved to be uninjured and these plants re-established satisfactorily when reset.

Winter gave way to a cold, lingering spring which proved to be too much for a young Magnolia Sieboldii planted in the spring of 1990.

Next, came dry weather producing drought conditions for the early summer at a time when we usually have sufficient moisture. This situation resulted in virtually no fungus disease but, when combined with the mild winter, produced an incredible number of insects which proceeded on a chewing rampage.

Endless rain followed the drought and lasted throughout autumn. Fungi attempted to regain lost ground and proceeded to flourish but at least plant material had the opportunity to pick up moisture before winter freeze up.

3.3.2 DEVELOPMENTS

Various tasks were accomplished in 1991. The wooden borders surrounding the beds in the Acadian Cottage Garden had become rotten and soft and so were replaced by approximately 250' of 1' diameter logs and also in this area, a new trellice was erected for the Bear River grapes. The maintenance compound fence was straightened and the main gate widened to permit access by trucks.

Topsoil and sod were added to the marsh interval area as part of an ongoing attempt to improve the grade and surface. These actions will facilitate maintenance and development of this important part of the Gardens.

Various beds on the Upper Pond Lawn were expanded and re-shaped with new material being added and in the fall of the year a young Castor Aralia (Kalopanax pictus) was moved to an adjacent position.

In the Innovative Garden several new fruit trees were added, including Novamac and Nova Easygro apple trees developed at Kentville and Profoanoff and Ptitsin Plums which are of Soviet origin.

During 1991, the Rose Garden saw 89 rose plants planted, mostly as replacements for tender plants lost over time or as improvements to the hedge area. One interesting addition was the hybrid *Rugosa* 'Agnes' which was developed in Canada by Saunders in 1922. This plant is one of the few yellow Rugosa roses known.

In the Ericacious plants area an effort was made to acquire some of the Rhododendron and Azalea cultivars developed at Kentville. Grand Pre, Minas Maid, Minas Gold, Evangeline and Gabriel were planted as well as some plants of *Amelanchier* cultivars currently being tested there by Dr. Hicklenton. Also planted in this area was a Rhododendron bred by local grower Alex Munts.

Herbs were removed from the Large Knotte in the Knotte Garden to prevent overcrowding and placed in an area of their own. This Knotte was subsequently mulched as a materials Knotte.

In order to commemorate the tenth anniversary of the opening of the A.R.H.G. in August 1981, a display bed was laid out in the area of the Grass Collection.

Various herbacious perennials were added to the Gardens in 1991, mainly to the Perennial Borders, Rock Garden, and Stream areas. Approximately 95 plants of 25 new varieties of herbacious perennial were planted as well as 32 plants of 26 new varieties of woody perennial. One large order became lost in the computer of an Ontario nursery resulting in this order eventually being cancelled.

Annual plant material planted in 1991 consisted of some 13,104 plants of 104 varieties.

3.3.3 ATTENDANCE

The attendance for 1991 was 26,174.

Chapter 4

WEED SCIENCE SERVICES

By Doug Doohan, Supervisor

4.1 OVERVIEW

Weed control with preememergent herbicides applied early in the season was generally satisfactory. However, weed control with herbicides applied later, as the 1991 drought progressed, was unsatisfactory. This was particularly true with postemergent herbicides. Moisture stress on certain crops was so severe that weeds emerging with the crop were capable of inflicting severe damage on the crop before postemergence herbicides could be applied.

4.1.1 CEREALS

Herbicide performance was poor in many fields due to drought prior to and following application. However, cereal crops appeared better able to cope with dry conditions than most broadleaf weeds of which many species remained stunted and were dying by early July.

Serious infestations of field mint and round-leaved mallow were observed in various parts of the province. These are relatively "new" weed problems and will be difficult and costly to control. Current research is addressing these problems.

Quackgrass, scentless chamomile and wild oats are serious problems on many farms. Quackgrass should be less of a problem in years to come as farmers obtain better control through lower cost herbicide options. Scentless chamomile can be controlled adequately in spring cereals with the new herbicide Refine Extra. Buctril M is the only herbicide that can be used to control scentless chamomile in winter cereals. Growers are not making significant efforts to control wild oats.

4.1.2 CORN

Weed control appears to be improving in this crop. More growers are aware of their problems with triazine resistant broadleaf weeds and are planning appropriate control measures. Control of annual grasses continues to be a problem for a few farmers. These grasses can be controlled with carefully timed postemergence herbicide treatments.

The very high cost of herbicides needed for broad spectrum weed control in corn should motivate growers to consider alternate approachs including mechanical control and better rotations. Accurate weed identification is essential to minimise costs.

4.1.3 SOYBEANS

A number of growers experience product failure with imasethapyr (Pursuit) herbicide. They were all first time users of this newly registered herbicide. Dry weather combined with inexperience seems to be responsible. This experience illustrates the importance of ongoing provincially supported herbicide evaluation research.

4.1.4 PASTURES

Municipal inspectors under the Weed Control Act have work closely with researchers from the Nova Scotia Agricultural College and Agriculture Canada in evaluating biological controls on pasture weeds.

4.1.5 VEGETABLES

Weed control in most vegetable crops relies on an integration of tillage and herbicides. Generally, new herbicides are not being developed for use on horticultural crops because of small market potential. Additionally, many herbicides recommended for use on vegetables are being removed from the market for various reasons. Because of unavailability of herbicides growers are relying increasingly on cultivation and hand-weeding. This is usually thought of as a very positive trend; however, benefits resulting from decreased herbicide use may be off-set by negative environmental effects of tillage such as destruction of soil texture and increased erosion.

There are no herbicides registered for use on cole crops that will provide acceptable, broad-spectrum, weed control.

Carrot growers have been told that they can no longer use the herbicide Gesagard to control scentless chamomile because this herbicide is not registered for carrots in the United States, the major market. This means hand weeding will be necessary for most fields in the 1992 season. A Minor Use Program has been initiated to find alternative herbicides to control scentless chamomile.

Dinoseb, the major herbicide used for weed control in beans and peas, will be removed from the market as soon as a safe and effective alternate can be found. A cooperative research program with Agriculture Canada is underway to evaluate alternatives and seek registration.

4.1.6 FRUIT CROPS

Velpar and atrasine are the principal herbicides used for weed control in lowbush blueberries. Several growers experienced moderate to severe crop injury with these herbicides in 1991. Over the past few years many growers have started using reduced rates of Velpar because of perceived injury problems. Cultural practices and the weed flora in blueberry fields are changed considerably from those current when Velpar and atrasine were registered in the late 1970s. Injury problems with established use patterns may be related to these changes.

A three year cooperative program with Agriculture Canada to develop new use patterns for Velpar and atrasine has been funded. Hopefully these studies will lead to recommedations that will reduce crop injury while maintaining or improving weed control.

Funding was obtained for a joint project with Agriculture Canada to develop improved weed control recommendations for strawberries.

Tufted vetch continues to be a problem in orchards. Rough bedstraw (cleavers) appears to be increasing in orchards as well. Repeated use of simasine year after year in certain orchards has resulted in the development of a flora of resistant broadleaf weeds under the trees. Alternative herbicides to simasine are available but growers will need to be educated regarding their use.

4.1.7 FORAGES

Weeds are a major problem in establishment of forage crops. Herbicides are not available to control many weeds and post-planting tillage is not generally an option. Weed control in forage crops in Nova Scotia

is further complicated by the high frequency of farms on which forages are the only crop; therefore, crop rotation does not provide an opportunity for weed control.

Future research should be funded to study the development of seedling forages with and without weed competition.

Round leaved mallow and velvetleaf continue to increase their range.

4.2 EXTENSION SERVICES

Extension calls to growers were handled by Dr. Doug Doohan, Weed Science Extension Specialist, Ms. Lise LeBlanc, Weed Specialist- Regulatory Services and Mr. Keith Silver, Weed Science Technologist.

Operation Spraycheck, a sprayer calibration program, was available in the 1991 growing season. Forty sprayers were calibrated on-farm during the summer.

Weed Science Services staff coordinated or participated in the following extension training opportunities in 1991.

-
- Crop Rotation Symposium (Kentville)
- Weed Inspector Annual Meeting
- Atlantic Canada Weed Tour
- Landscapers Certification Program
- NSDAM Staff Conference
- Principles of Weed Control Course (NSAC)
- Blueberry Producers Twilight Meetings
- Crop Development Institute Summer Research Tour
- Blueberry Growers Association of Nova Scotia Annual Meeting
- Strawberry Growers Association of Nova Scotia Annual Meeting

Throughout the growing season, staff responded to approximately 600 request for information on weeds and their control. This included farm calls, letters, telephone calls and office visits. Approximately 1000 copies of the Guide to Weed Control were distributed throughout the province. Several articles dealing with weeds, weed control and the safe use of pesticides were prepared for crop newsletters, newspapers and the Agrogram.

4.3 WEED SCIENCE RESEARCH

4.3.1 VEGETABLES

Trials were conducted on processing peas and snapbeans in search of a replacement for dinoseb for the control of broadleaf weeds. Though some treatments gave weed control results as good as or better than dinoseb, none showed the same degree of crop safety.

4.3.2 CEREALS

Trials were conducted to determine the best fall herbicide treatment for scentless chamomile control. Treatments that provided good control in previous trials were re-evaluated. Refine, Target, Kilmor, Buctril M and Estaprop all provided excellent long term control into the next growing season. Buctril M is currently the only treatment registered for fall application.

Refine Extra has recently been registered for broadleaf weed control in spring cereals. This herbicide should provide excellent control with of a number of troublesome weeds, including; scentless chamomile, corn spurry and hempnettle.

Trials were conducted in barley to determine crop injury and yield loss when applied at different crop growth stages. Herbicides were applied at Zadox:12 (2 leaf), 23 (3 tillers) and 32 (2 nodes). Barley sprayed at Zadox:32 showed a marked decrease in height and/or yield. Herbicides containing dicamba caused significant yield loss in 1991 trials at all but the earliest timing. Dicamba inhibits root formation which would exacerbate injury in a dry year. Refine Extra may be a favourable alternative to dicamba containing products for control of "hard-to-control" weeds .

4.3.3 CORN

Trials were conducted in 1990 to evaluate herbicides for annual grass control and triazine resistant weeds.

Dual is the standard treatment for fields infested with crab grass. Dual is only one component of the weed control program for grass infested fields and its cost alone is in the range of $40 per hectare. Farmers who have problems with other species such as barnyard grass and old witch grass may be able to save money by using Bladex rather than Dual. This requires scouting fields to determine weed species present.

Atrazine applied preemergence at 1.00 kg/ha followed by Buctril M applied late postemergence at 0.56 kg/ha continues to be the most economical and effective control for a wide spectrum of broadleaf weeds including triazine resistant bio-types.

4.3.4 STRAWBERRIES

Several trials were conducted to evaluate herbicide treatments for a number of serious perennial weeds occurring in strawberry fields. A significant discovery was the good control of creeping buttercup and grass-leaved stitchwort with preemergence or early postemergence applications of the recommended herbicide Devrinol.

Additional studies were initiated in 1992 to determine the lifecycle of creeping buttercup and to further evaluate methods of control.

4.3.5 BLUEBERRIES

A trial was established at Rawdon to investigate claims of blueberry injury from standard treatments of Velpar applied in the spring after pruning. Foliar injury was observed with treatments ranging from 0.5 to 4 kg/ha. Fruit bud counts were reduced at rates of 2 and 4 kg/ha.

4.3.6 APPLE ORCHARDS

In our continuing trial on newly planted apple orchard, terbacil continues to provide surprisingly good suppression of quackgrass and tufted vetch. There is also an indication that oxadiason is suppressing vetch. Simazine gives very poor results on quackgrass and vetch. Increased tree growth (height and caliper) was evident on plots treated with terbacil.

4.4 REPRESENTATION

Weed Science Services Staff represented the Nova Scotia Department of Agriculture and Marketing in the following organizations:

4.4.1 EXPERT COMMITTEE ON WEEDS — E.C.W.

The E.C.W. (Eastern Section) is the working committee responsible for the testing and recommendation of weed control methods for Eastern Canada. Staff were very active in the work of this committee, particularly in promoting research and development of weed control methods of value to Nova Scotia agriculture. The E.C.W. reports directly to the Canadian Committee on Crop Production Services therefore this representation had provided the opportunity to effectively communicate regional weed research and extension needs.

Dr. Doohan is the Secretary-Treasurer of the Committee.

4.4.2 CANADIAN ASSOCIATION OF PESTICIDE CONTROL OFFICIALS — CAPCO

The Department was represented at the bi-annual meetings of CAPCO. Federal regulatory bodies rely heavily on CAPCO for input on the regulatory and policy needs of the provinces. CAPCO is working actively through its various committees on the subjects of certification and training of applicators, safety apparel, pesticide container disposal, groundwater issues and regulatory affairs. CAPCO provides the opportunity for information exchange and provincial input to regulatory polciy and decisions.

4.4.3 ATLANTIC CROPS COMMITTEE — ACC

Weed Science Services Staff are active in the following ACC committees:

- Atlantic Committee on Pest Management
- Atlantic Weed Science Sub-Committee
- Atlantic Berry Crops Committee
- Atlantic Greenhouse and Ornamentals Committee
- Atlantic Vegetable Committee
- Atlantic Cereal Crops Committee

Staff regularly cooperate in the preparation of ACC publications.

4.4.4 ATLANTIC VEGETATION MANAGEMENT COMMITTEE

Ms. Lise LeBlanc, Weed Specialist — Regulatory Services, is the Departments official member of AVMA. AVMA provides opportunity for technical information exchange, public relations and development of policy statement of interest to vegetation management specialists and regulators. Activities conducted under the Weed Control Act fall within the aegis of the Association.

Staff are members of and serve on committees of the Weed Science Sociey of America, the European Weed Research Society and the Canadian Pest Management Society. During 1991, 4 papers were published in journals of the Weed Science Society of America by Section staff.

4.5 WEED CONTROL ACT

This legislation has supported the control of many weeds that are detrimental of food production in Nova Scotia. The legislation is designed mainly to protect and preserve farmland quality but it also provides legislation whereby poisonous weeds are subject to strict control measures.

The Act encourages the appointment of various Municipal Weed Inspectors as noted in Table 4.1.

Total costs for this year amounted to approximately $150,000.00. This includes Sections 7, 8 and 9 of the Regulations to the Weed Control Act as well as costs involved under weed control along riverbanks.

Three meetings of the Weed Inspectors were held this year; the annual fall and spring meeting and a public relations skills seminar day in August. During the meetings the inspectors were updated on Regulations, pesticide application, weed control and identification, roadside weed control programs, railtrack programs, etc.

A velvetleaf survey was conducted in all counties. One hundred and eleven (111) farms contained velvetleaf ranging from 1 to over 200 plants per farm. An extensive publicity campaign was conducted ranging from posters, live specimen displays and written articles. Cooperation is ongoing with the various feed companies to determine a solution to this very serious problem. Farmers in the United States and central Canada spend over $350 million annually in control measures and lost yield. This weed continues to be an ongoing priority.

Muncipal weed inspectors continue to cooperate with Agriculture Canada and NSAC scientists on biological control of poisonous pasture weeds using insects and plant pathogens.

Roadside weed control was conducted with the Nova Scotia Department of Transportation and Communications. This was conducted in Colchester, Pictou, Antigonish, Hants and Kings Counties. Delays in the program occurred due to a number of circumstances.

4.5.1 WEED INSPECTOR WORKING GROUP

The working group continues to evaluate programs operated under the Weed Control Act and to make recommendations regarding the future programs relative to the Act. A document has been written containing proposed changes to the Weed Control Act. The document will be presented to the Weed Advisory Committee for consideration.

Table 4.1: Municipal Weed Inspectors Appointed Under the Nova Scotia Weed Control Act

COUNTY	INSPECTOR	MAILING ADDRESS	CODE
Annapolis	VAN ROESTEL, Pam	RR #1 Bridgetown	B0S 1C0
Antigonish	VAN OIRSCHOT, Joe	RR #2 Antigonish	B2G 2K9
Argyle	HANF, Joanne	P.O. Box 10, Tusket	B0W 3M0
Cape Breton	MACKENZIE, D. Rodney	283 Coxheath Rd, Sydney	B1R 1R8
Colchester	VAN OIRSCOT, Tom	37 Pictou Rd, Truro	B2N 2R9
Cumberland	MCMASTERS, Bruce	RR #1 Collingwood	B0M 1E0
Digby	WARNER, LeRoy	RR #1 Barton	B0W 1H0
Halifax	HULL, Brian	RR #1 Shubenacadie	B0N 2Y0
Hants East	SAUNDERS, Gordon	RR #1 Elmsdale	B0N 1M0
Hants West	CURRY, Traci L.	RR #2 Falmouth	B0P 1L0
Inverness	MACMILLAN, Peter	RR #1 Whycocomagh	B0E 3M0
Kings	FRANK, Eric W.	P.O. Box 100	B4N 3W3
	MILLETT, Don	Kentville	
Lunenburg	PELLEY, Sarah	RR #1 LaHave	B0R 1C0
Pictou	POST' Adrian	RR #2 New Glasgow	B2H 5C5
Richmond	O'HEARN, John	RR #1 D'Escousse	B0E 1A0
Yarmouth Co.	WHITTAKER, Trent	RR #5, Yarmouth	B5A 4A9
Yarmouth Town	CUSHING, Loren	403 Main St., Yarmouth	B5A 1G3

Chapter 5

PLANT PATHOLOGY, ENTOMOLOGY, APICULTURE

5.1 PLANT PATHOLOGY

By Rick Delbridge, Plant Pathologist

5.1.1 BERRY CROPS

Strawberry

During the last two seasons powdery mildew has been very severe in a number of plantings in the province. Growers can readily recognise the disease in the foliage but infections of immature fruits cause them to become hard, fail to ripen normally and appear seedy. Infected ripe fruit become soft and pulpy. The cultivars Honeoye and Cavendish were particularly prone to fruit infections while Raritan, Veestar, Cavendish and Annapolis had severe leaf infections.

Fruit russeting also occurred in some fields, particularly in the Great Village area. The problem occurred primarily in the cultivars Blomidon and Honeoye in 1990 but a number of different cultivars were affected in 1991. Apparently, New Brunswick experienced similar problems and found thrips associated with the russeting. Further observations will be conducted next season.

Angular leaf spot also caused problems last season. Leaf symptoms were quite obvious but the bacterium also caused infections of the fruit hulls which made the fruit unmarketable. Sprinkler irrigation for frost and drought control aggravated the disease.

A new disease was identified in Nova Scotia last season. It was leather rot caused by the fungus *Phytophthora cactorum*. Although the disease was first reported in 1924 from the southern US, it was not found in the Northern US until 1981. During the 80's it caused heavy losses in some seasons especially in Ohio and Ontario. It was not found in the Atlantic region until last year in Nova Scotia. It occurred in mid-late August in day neutrals.

The fungus causing leather rot has a wide host range and may cause a crown rot and fruit rot in strawberries. It attacks fruit at any stage of development from green to ripe berries. Green berries turn brown to dark brown and become hard. Maturing berries appear bleached and range in color from light brown to purple. Fruit have a bitter flavour. Under damp conditions white mycelium may be seen on infected fruit. Infected fruit dry up and become very leathery and thus the name leather rot.

The fungus survives the winter as thick walled resting spores called oospores. These form in mummified fruit. The oospores remain viable from one year to the next in the bed. When there is enough moisture and it is warm enough in the spring and summer the oospores germinate to produce sporangia in which soospores are produced. Zoospores are able to swim in free water and germinate to penetrate fruit. Secondary infections

occur when sporangia are produced on infected fruit. They are splashed by wind driven rain or irrigation to healthy fruit where new infections take place. Infection takes place between 17-25°C. Mummified fruit drop to the ground where oospores form to complete the life cycle.

All fungicides do not control leather rot. For example Benlate, Easout and Rovral provide no control whatsoever while captan and folpet are reasonably effective. Therefore for leather rot and *Botrytis* fruit rot control it is important to use combination treaments of fungicides so that both diseases are controlled.

Verticillium wilt was found in one location in 1991. Four acres of Micmac and Raritan were totally destroyed. The field had been in potatoes three years previously. *Botrytis* fruit rot was seldom a problem due to the relatively dry weather during blossoming. Red stele continues to be a problem in some plantings. Fungicide resistance is a problem so use of red stele resistant varieties is the safest control option. A great many diseases were identified and diagnosed during the season: phytotoxicity by pesticides, herbicide injury, leaf spot, scorch, storage mold, fertilizer burn, green petal, leaf blotch, drought injury, winter damage, etc.

Extension Activities & Programs

I attended and spoke at the Strawberry Growers of NS Annual Meeting held in Truro. Consultation services were provided to growers. Regular contributions were made to the Strawberry Newsletter. One publication was revised during 1991. Farm calls were made during the season on a regular basis.

Strawberry Nursery Inspections

Five field inspections were conducted in 1991 to the five certified nurseries. Powdery mildew continues to be a difficult disease to control.

Red Stele Detection in Nursery Stock

The red stele detection procedure continues to be an important ingredient in our certified nursery scheme. Tests are conducted on all fall dug nursery stock. This program instills confidence in our nursery program and helps ensure that infected nursery stock is not sold.

Strawberry IPM Program

An Integrated Pest Management Program was once again offered to six growers in Pictou and Colchester Counties. The program will be expanded to include growers in the Annapolis Valley in 1992.

5.1.2 LOWBUSH BLUEBERRY

Monilinia blight and Botrytis blight were not significant problems in 1991. *Monilinia* bight was severe in some fields in the Yarmouth area where heavy soils and fog contributed to the problem. In the remainder of the province spring conditions (late April-early May) were not conducive for *Monilinia*. Although several light frosts did occur in early May (6,10,12,15) which would have made the buds more susceptible, little rainfall followed to develop infection periods. The blossom period was also relatively dry and therefore *Botrytis* was not a factor.

A few growers reported minor defoliation in July and early August due to drought, powdery mildew and leaf rust.

Mummy Nurseries (Monilinia Blight)

Fruit infected with *Monilinia* were placed in fields in various locations within the province. These locations were staked and the development of the resulting apothecia was monitored throughout the spring of 1991. This is an excellent way to time fungicide applications for fields in the vicinity.

Meetings & Extension

Nine field days were conducted in 9 different areas within the province in May and June. Diseases, insects & weeds were discussed. These mini field days were very useful because growers could actually see and learn how to identify the two blueberry blights. Meetings were held in West Caledonia, Kemptville, East Gore, Debert, Westchester, Newton Mills, Blue Mountain, Lochaber and Parrsboro.

Many farm and field visits were made during the growing season. Two fact sheets were revised and contributions were made to the blueberry newsletter.

5.1.3 RASPBERRY

A number of growers reported lower yields due to winter injury. Late yellow rust was not a serious concern in 1991. Other diseases such as powdery mildew, spur blight, anthracnose, and Botrytis blight although present in most plantings, were kept to low levels by dry conditions in July and early August. *Phytophthora* root rot is suspected in a home garden in the Kentville area. Regular nursery inspections were conducted as were farm visits upon request.

5.1.4 GRAPES

Powdery mildew was controlled very effectively by most growers this season. Botrytis bunch rot was a problem in some varieties especially Michurinets. Wet conditions in late August and September made control difficult. During the year I attended several grape meetings and spoke on disease concerns and control.

5.1.5 HIGHBUSH BLUEBERRY

Godronia canker continues to be the most serious disease of highbush blueberry and will likely get worse since there are no fungicides registered for control. *Anthracnose* is also a serious disease particularly on harvested berries destined for the New England Market. Extension activities included grower visits, consultations and a disease presentation to the Highbush Blueberry Growers Annual Meeting.

5.1.6 VEGETABLES

Potato late blight was not found in the province until very late in the season (Oct. 15). This was due to the drought conditions in July and early August and the fact that there was very little innoculum present from the previous year (no blight was observed in 1990). PVY^n was found in Nova Scotia in 1991 in a lot of Norchip seed originating from PEI. This seed was shipped to Nova Scotia prior to the February 1991 ban on movement of seed from PEI Districts 1–4. A disposal notice was issued to the grower and the fields were topkilled on August 12, 1991. A total of 57 acres were affected. This was the only positive lot found in Nova Scotia. A total of 40 leaf samples were taken during the season and all were negative for PVY^n except for the above mentioned lot. Leaf testing concentrated on Nova Scotia seed fields.

Potato scab was a problem in some cultivars because of the drier soil conditions. Norwis, a fine chipping cultivar, is very susceptible to scab. Wet conditions in September and October stressed potato tubers and led to some storage disease problems during the winter.

Bacterial decay caused by *Pseudomonas marginalis* was identified as causing a breakdown of packaged local spinach in September and October. The spinach appeared to be in good condition at the time of bagging but shortly after reaching the retail level it broke down. Wet conditions, mechanical damage and poor temperature control at the retail level all contributed to the breakdown. Two post harvest dips using sodium hypochlorite and chlorine dioxide were tested but each failed to control the bacterial decay. The best control was maintaining proper temperatures in storage, transit and when on display at the retail level.

Carrot defect problems are a serious concern in the processing sector in Cumberland and Colchester Counties. Poor recoveries at the processing plant plague this industry. Splits, cracks, knobs, forks, black discoloration and oversize lowered carrot quality. Dry weather followed by wet September conditions was certainly responsible for many of the problems but crop management factors such as cultivar selection, rotation, fertility, spacing and field preparation are also implicated. Some fields suffered from "wet feet" in September and October which caused decay of the lower tap root. The storage life of crops such as carrot, rutabaga, squash, potato, parsnip and cabbage will be shortened due to the wet field conditions.

Elite seed potatoes were once again purchased from the PEI Potato Marketing growers. In 1991 there were 5 Nova Scotia seed producers with a total of 183 acres. The main varieties being grown were Novachip, Superior and Norwis. As required by regulations to the Potato Industry Act all seed potatoes imported into Nova Scotia from outside Canada were sampled and tested for bacterial ring rot. The seed was also PVY^n tested. All samples were negative. The majority of the seed originated from the state of Maine.

A severe case of black rot developed in a large cauliflower planting in Kings County. The disease appeared to originate from an infested seed lot of Sierra. The disease spread from this source to other cauliflower and cabbage in the field. Broccoli head rot was not a serious problem due to the dry weather in July and August but several episodes of the disease occurred in mid-late August with the precipitation.

Processing peas and beans suffered through the droughty conditions in July and August and this had a marked effect on yield and disease levels. *Sclerotinia* white mold requires wet soil conditions for apothecial development and therefore this disease did not impact the crop significantly.

In addition to normal farm calls, telephone and mail inquiries and newsletter items, I participated in a number of grower meetings including the VPPA Annual Meeting, Cole Crop Short Course and the NS Potato Marketing Board Annual Meeting.

Hot Water Seed Treatment Service

Cole crop seed was treated for commercial growers in order to eliminate seed borne disease.

Potato Late Blight Forecasts

Potato late blight forecasts were issued twice a week from July 2 to September 19, 1991. Forecasts were based on temperature and humidity data collected in the field. Forecasts were carried on the Vegetable Market Line and the computerized bulletin board in Truro.

5.1.7 GREENHOUSE AND PROTECTED CROPS

Pythium root rot and damping off plagued a number of bedding plant and vegetable growers. Soil mix problems were widespread with one particular commercial mix. Seedlings grown in the mix corresponded to typical boron deficiency symptoms. In most cases it was not possible to bring the plants out of the problem with the addition of trace elements. Greenhouse diseases diagnosed in 1991 included tomato spotted wilt virus, *anthracnose*, pith necrosis (tomato), powdery mildew, gummy stem blight (cucumber), *Rhizoctonia* damping off, *Botrytis* blight and fertiliser burn.

Phytophthora root rot continues to be the most important disease of ginseng. It can be a limiting factor to this crop. Alternaria leaf blight was diagnosed just once in 19991.

5.1.8 COMMITTEES

The Expert Committee on Pest Management, Insects/Diseases met in Vancouver, BC November 25, 26 and 27. A joint meeting was held with the Expert Committee on Weeds to discuss areas of common interest. The 1992 meeting will be held at the NSAC in Truro NS.

5.2 ENTOMOLOGY — BERRY CROPS AND VEGETABLES

By Lorne M. Crozier, Entomologist

5.2.1 OVERVIEW

The lowbush blueberry insect survey had 35 participants and covered a total of 315 fields. Twenty-one fields had insect pest populations which required control measures. A survey of 21 fields for blueberry leaftier showed very low infestations of this insect in 1991.

The strawberry pest monitoring program was continued on six farms in Colchester and Pictou Counties. Insects were not a major problem in strawberries this year. The monitoring program will be expanded in 1992.

Cranberry pests were monitored in one bog. Infestation levels were very low.

In the vegetable sector, diamondback moth and imported cabbageworm populations were relatively low this year. Corn earworm and cabbage loopers were more prevalent during the latter part of August. Onion thrips levels were high during July and affected several crops including onions, leeks and cabbage.

A total of 409 specimens were received for identification. Household pests and ornamental pests were the most commonly received samples.

Activities and participation in short courses, field demonstrations and meetings are also outlined.

5.2.2 LOWBUSH BLUEBERRY INSECTS

The annual sweepnet survey was continued this year. The number of growers who participated was 35 and the number of fields surveyed was 315. This compares to 42 growers in 1990, and 297 fields. Michelle Ralph, a third year student at the Nova Scotia Agricultural College was hired to pick up and sort the samples.

The total number of fields with insect infestations was 27 the same as the previous year. Case beetle populations remained at low levels again this year. Blueberry leaf beetle infestations and blueberry sawfly populations were lower than in 1990. Blueberry flea beetles, and blueberry spanworms were a problem in 10 and 8 fields respectively. These are both increases over 1990.

Two other species of spanworm were found in significant numbers in three fields. They are closely related to the blueberry spanworm. They will have to be considered as potential pests in future surveys.

Red-striped fireworm outbreaks occurred in two fields. This insect has not been a problem since 1972.

A separate survey for blueberry leaftier was conducted in the Diligent River area. A total of 21 fields were sampled by collecting blueberry shoots and examining the fruit buds for leaftier damage. Levels of infestation were very low for the second consecutive year. A detailed report of both of these surveys is available in the Plant Industry Project Reports.

Blueberry fruit fly continues to be a concern for blueberry processors. A greater effort is being made by many growers to control this insect. Traps for monitoring the adult flies are made available to growers, free of charge, by the Blueberry Producers' Association of Nova Scotia.

A problem arose concerning the use of dimethoate for control of blueberry fruit fly. This product is not registered on blueberry in the U.S.A. Two shipments of berries from Nova Scotia to Maine were detained because residues of dimethoate and its metabolites were found on the berries. The U.S.A. has zero tolerance for chemicals not registered in the U.S.A.

5.2.3 STRAWBERRY INSECT PESTS

In 1990 the Strawberry Growers' Association of Nova Scotia initiated a strawberry pest and disease monitoring program; with Rick Delbridge and myself as project leaders. Funding was obtained through AFDA.

This is a four-year project, aimed at reducing the number of pesticide applications used by growers. The second year of the project was much more successful than the first. An expansion of the program to include

more growers in a major portion of the growing region is planned for 1992. A detailed report of this project is included in the Plant Industry Branch Project Report.

Two spotted spider mite populations were not as prevalent this year. Nursery growers were advised not to apply miticides until mites were found in significant numbers in their fields. As a result the problem of resistance to miticides was avoided this year.

Two growers experienced considerable damage to their field by strawberry root weevil.

One grower experienced a problem with yellow jackets damaging his day neutral strawberries. The damage was caused by the yellow jackets feeding on the fruit.

I participated as a member of the strawberry nursery inspection team. All nursery plantings are inspected five times per season for any disease or insect problems.

5.2.4 CRANBERRY INSECTS

Pheromone traps were set out in a cranberry bog operated by Mr. Glen Hebb, Hebbville. The insects which were monitored were cranberry girdler and blackheaded fireworm. Trap catches were quite high for both species. Berry samples were also taken to check for cranberry fruitworm. One application of insecticide was recommended to control these insects.

Traps for sparganothis fruitworm did not detect any moths present. It appears that this pest is not present in Nova Scotia.

5.2.5 HIGHBUSH BLUEBERRIES

One grower experienced a problem with winter moth feeding in one block of his planting Light to moderate damage occurred.

5.2.6 VEGETABLE INSECT PESTS

In order to survey insect pest populations in the major vegetable growing regions of the province, a number of fields were monitored on a regular basis, using various insect traps. Four monitoring stations were located in Kings County, one in Annapolis County and one in Lunenburg County.

Pheromone traps for diamondback moth, cabbage looper, European corn borer and corn earworm were set out at appropriate locations. Sticky traps for detecting cabbage maggot and carrot rust fly were also used. These traps were checked on a weekly basis throughout the growing season. Corn earworm traps and pheromone caps were supplied to three growers; one in the Bras D'Or , one in River Philip, and one in Wileville.

In addition to my regular monitoring, I made one trip to Cape Breton to visit growers in that area.

5.2.7 COLE CROP INSECTS

Cabbage maggot was present in its usual numbers. Most growers had little problem keeping it under control.

Imported cabbageworm numbers were very low. Winter survival was apparently very poor. Significant numbers of this insect did not appear until September.

Cabbage looper caused some damage in August and September. This insect is very sporadic in its distribution.

Diamondback moth populations were relatively low throughout most of the summer. The problems experienced last year did not recur. Tests for resistance to permethrin were carried out by Agriculture Canada on one population of diamondback larvae. The results of this test were negative.

Hot dry conditions throughout the early summer contributed to an abundance of flea beetles. No control problems were noted.

Larvae of the painted lady butterfly were found in large numbers in one field of broccoli. The normal host plant for this species is thistle.

One grower experienced a problem with a produce wholesaler, who refused to accept a shipment of Chinese vegetables because of the presence of insects in the produce. I investigated the growers field and found that the insects were non-pest species which were inadvertently trapped at the base of the plants.

5.2.8 SWEET CORN INSECTS

European cornborer populations were light to moderate. Corn earworm flights were heavy in mid August. Fall armyworm numbers were very low.

5.2.9 POTATO INSECTS

Colorado potato beetle populations were about normal this year. One commercial grower received complaints when large numbers of beetles migrated from his field after the potatoes were top killed. The beetles accumulated on the sides of nearby houses. This large population of beetles occurred because there had not been a sufficient number present in the field to warrant control measures.

5.2.10 OTHER VEGETABLE INSECTS

Tarnished plant bug caused considerable damage to a field of lettuce. The feeding activity of the adult bugs caused browning along the mid veins of the leaves. This infestation occurred very close to harvest, therefore no control measures were possible.

Onion thrips were very abundant in both onions and leeks. The hot dry weather throughout most of the summer was very favourable to this insect.

Small fruit flies were a problem in one storage building which was being used to dry and store onions.

5.2.11 ORNAMENTAL INSECT PESTS

Chinch bug populations were extremely high in all regions of the province. Even areas which do not normally have chinch bug problems, experienced outbreaks this summer. In many cases entire lawns were destroyed. Many reports of chinch bugs covering the sides of buildings were received. Hot dry weather conditions were a primary factor in allowing chinch bug numbers to build up.

Winter moth and fall cankerworm were abundant on many ornamental trees this spring. Conditions for oviposition were excellent in October and November of 1991. There is good potential for these insects to be abundant in 1992.

Alder flea beetles were extremely numerous this year. While this insect feeds chiefly on alder, the large numbers that were present caused concern to people who were not familiar with these beetles.

Red humped caterpillars, fall webworm, and other general leaf feeders were also abundant on trees this summer.

As part of my involvement in the ornamentals program I participated in an information booth at the Garden and Patio Show in Halifax.

I attended a discussion on Japanese beetle, in Halifax. The purpose of this meeting was to outline pending regulations intended to help delay the spread of this insect in Canada. Nova Scotia will be designated as a Japanese beetle free area. It is expected that we will be participating in a monitoring program in 1992.

5.2.12 INSECT IDENTIFICATION

A total of 409 specimens were received for identification. This is an increase of 107 over last year.

Household pests accounted for 128 or 31% of specimens received. These included larder beetles, merchant grain beetles, booklice and other stored food product pests.

Several specimens of spiders were identified. Interest in spiders arose when several specimens of black widow spiders were reported found in grapes. Only one of the samples I received was a black widow spider.

One hundred and thirteen specimens (28%) were non-economic insects. These included several giant water bugs, Polyphemus and Cecropia moth caterpillars, and other similar oddities.

Insect pests of ornamentals comprised 14% or a total of 59 specimens. These have been discussed in a previous section.

I received 30 specimens from the Department of Health and Fitness. A number of these were ticks. Considerable interest has been shown in ticks as one species is responsible for the spread of Lyme disease. I have been able to provide an identification service to the Department of Health and Fitness. Any dubious specimens are forwarded to the Biosystematics Research Centre in Ottawa.

Only one specimen of *Izodes dammini*, the deer tick, was received. This tick is capable of carrying Lyme disease. The specimen was removed from a cat.

Other ticks received included seven groundhog ticks, *Izodes cookei*; and four American dog ticks, *Dermacentor variabilis*.

A total of seven samples were sent in by veterinarians. Some of these were included in the list of ticks submitted above.

Twenty-eight specimens of home garden pests were identified. This number is somewhat higher than in the previous year when only 16 specimens from home gardens were received.

Forty-four or 11% of the specimens were from commercial operations. These included growers from a number of sectors, including greenhouse, vegetable, berry crops, cereals as well as some from non-agricultural industries.

5.2.13 OTHER EXTENSION ACTIVITIES

I took part in several short courses including two on ornamentals and an oyster mushroom production course.

I gave two lectures at the NSAC - one to the Entomology seminar course and one to the Cereals Production course.

I gave a talk on insect orders to a grade four class at the East Court Rd. School, Bible Hill.

I gave a presentation on insect pests to a home garden group in Scotch Village.

Reports were presented at the Strawberry Growers Association annual meeting,the Vegetable and Potato Growers annual meeting and the Blueberry Producers Association annual meeting.

I participated in nine field demonstrations on monitoring blueberry insects.

In out-of-province activities, I took part in the Atlantic Committee on Crops meetings at Memramcook, New Brunswick. At these meetings I participated in three advisory committees including pest management, berry crops and vegetable production.

I attended the North American Strawberry Growers Association meeting, and the North American Bramble Growers meeting in St. Petersburg, Florida. I set up and manned a display on N.S. certified nursery plants at the N.A.S.G.A meetings.

I presented a paper on the status of Colorado potato beetle in Nova Scotia at the joint meeting of the Acadian Entomological Society, and the Canadian Pest Management Society in Fredericton New Brunswick.

5.3 TREE FRUIT ENTOMOLOGY

By R. E. L. (Dick) Rogers, Entomologist

The pilot study phase of an intensive IPM project was conducted in 9 orchard blocks in 1991. Some of the results were included in my presentation to the Nova Scotia Fruit Growers Association and are published in the 128th Annual Report of the Association under the title "Pushing IPM to the Limit".

5.4 APICULTURE

By R. E. L. (Dick) Rogers, Apiculturist

5.4.1 OVERVIEW

The Nova Scotia Beekeepers' Association represents an industry that in 1991 produced 210,000 kg of honey with an estimated retail market value of $630,000 and provided an estimated 5000 honey bee colonies for the pollination of blueberries in Nova Scotia. The revenue generated from hive rentals for blueberry pollination in 1991 was approximately $250,000 - the value of the blueberry crop was at least $15 million. Many other crops and wild plants also benefit from honey bee pollination. Local nucleus hive and queen bee sales are increasing and generated about $22,000 for beekeepers in 1991. The total cash value of the beekeeping industry in Nova Scotia was just under $1 million in 1991 as industry growth lives up to its forecast potential.

5.4.2 STATISTICS

Table 5.1: Nova Scotia Beekeeping Statistics 1991

	1990	1991
Est. total no. beekeepers	380	400
No. of colonies	6200	7000
Avg. no. col/beekeeper	16.3	17.5
Honey yield/col (kg)	35.0	30.0
Total honey production (kg x 1000)	217.0	210.0
Value of honey crop ($ x 1000)	651.0	630.0
Value of industry (honey, wax, pollen, pollination services x $1000)	884.0	945.0
No. of col. wintered 90/91	6000	6900
Est. no. apiaries in Province	800	600 (1)

(1) Revised down from previous year.

In 1991, 95% of beekeepers had operations with 1 - 50 colonies, 4% had 51 - 200 colonies, and 1% had 300 + colonies.

Table 5.2: The Number of Package Bees, Nucleus Hives and Queens Imported to Nova Scotia, 1984 — 1991

	84	85	86	87	88	89	90	91
1 kg. pkg. (or equiv.)	1704	1006	476	964	676	225	1421	1406
Nucleus hives	u/k	u/k	u/k	u/k	27	0	0	0
Queens	1929	2014	1963	2273	1336	1406	1601	1690

Table 5.3: The Number of Nucleus Hives and Queens Produced in Nova Scotia, 1986 — 1991

	86	87	88	89(1)	90	91
Nucleus hives	400	400	450	450	500	500
Queens	400	0	0	77	450(2)	600

(1) Queen rearing project started (AFDA project #TIP-51)
(2) 250 produced by project TIP-51 directly, balance produced by beekeepers

Table 5.4: Apiary Inspection Program: Results, 1986 — 1991

	86	87	88	89	90	91
No. Inspector/Assistants	2	2	2	2	2	2
No. col. inspected for disease	1378	1257	383	639	140	236
INCIDENCE OF DISEASE(% of hives inspected)						
American foul brood	6.5	1.8	1.3	3.0	6.4	7.6
European foul brood	6.0	8.8	3.4	8.0	10.7	15.2
Chalkbrood	28.4	27.2	24.3	32.0	31.4	34.7
Sacbrood	12.0	9.9	5.2	5.0	5.7	5.5
PARASITIC MITES						
No. samples for honey bee tracheal mite (HBTM)	52	29	0	165	165	591
Incidence of HBTM (% of samples testing positive)	0	0	-	0	0.6	1.4
No. samples for Varroa Mite (VM)	0	0	131	165	168	60
Incidence of VM (% of samples testing positive)	-	-	0	0	0	0

Chapter 6

AGRONOMY

6.1 OVERVIEW

The Agronomy Section is composed of specialists in cereals, forages, crop planning and in the general areas of Soils & Crops. An Agronomist working with the Cape Breton Federation of Agriculture, funded with assistance from the Canada/Nova Scotia Livestock Feed Initiative (ALFI) continued to work closely with the agronomy team. During this period Bill Thomas, Forage Specialist, returned to full time work after an absence in which he worked on requirements for his M.Sc. degree. Eric Bosveld, Soil and Crop Specialist, began an educational leave to complete his M.Sc. degree in September. Both these educational activities are involved in research projects that have a direct practical application to local forage management. Two Agricultural Technicians within the section assisted in conducting research and demonstration trials.

The Section planned and participated in a great number of extension type activities, including information meetings, seminars and field tours. In addition to these activities the section carries a heavy compliment of field research and demonstration trials. Crop Specialists work closely with County Soil and Crop Improvement Associations and the findings of the research and demonstration trials can be found in the Plant Industry Branch Project Summary Booklet.

The following section indicates the activities of the various specialists, as well as the activities of the various commodities for which responsibility falls to this section.

6.2 FORAGE CROP REPORT

Seasonal weather patterns in Maritime Canada are unpredictable and can have a profound effect on the quality and quantity of our crops. In fact, because of particular seasonal weather occurrences, 1991 will be remembered as a very poor year for forage production.

The on-again/off-again winter of 1990/91 caused field ponding, ice sheeting and frost heaving and resulted in significant winter kill in red clover, alfalfa and orchard grass. Late hard frosts in May further damaged recovering plants. The wet cold winter and late spring thinned out legumes from mixed stands and reduced first harvest yields by 20 to 30%.

With such a poor first cut, many looked to second cut to meet their needs, but drought in June and July prevented the usual regrowth following first cut and reduced pasture growth so severely that many farms were forced to start feeding cattle on pasture in early August. Most farmers were very nervous in late July, wondering whether they would be able to get enough forage for the winter. With low first cut yields and no grass regrowth to speak of, fields that had not seen a mower in years were being harvested as farmers searched to fill their mows. At the height of the drought, hay was trading at over four dollars a bale.

Rain returned to the province in early August. The baked fields responded quickly to the much needed rain and there was real hope for a second cut of hay. However in many areas of the province the rain never stopped long enough to cure hay, only those with silage were able to get a crop out of the field. Generally

farms with silage had enough forage for the winter. Farms where haying was the only option have found it difficult and many had to either get help to put up some silage or had to buy hay.

The value of having some diversity in forage crops was very apparent this year. Those farmers with just grass found it difficult to ensure enough winter feed. Many farmers with some legume stands or corn have more than enough forage and have been able to sell their excess at a premium price. Corn silage has sold for between 35 and 40 dollars a wet tonne.

6.2.1 NOVA SCOTIA FORAGE COUNCIL

The Nova Scotia Forage Council, although still a relatively young organization, continues to take a larger role in forage activities in the province. In 1991, the Council initiated a total farm forage package competition in cooperation with the Central Nova Soil and Crop Improvement Association. This competition, supported by Agri-business, considered everything from field selection and crop utilization to capital investment in the system.

The Council held a hay marketing seminar in conjunction with its annual meeting. The Council has been active in encouraging both the Provincial Grain Commission and the Nova Scotia Grain Marketing Board to become involved in hay marketing.

6.3 CORN

The crop that seemed to excel in 1991 was corn. The dry conditions of early summer and the rain in August helped to produce yields and maturity that were exceptional in some regions. The wet fall, however, made harvesting the crop somewhat of a challenge.

Many corn fields were too wet to carry conventional equipment. The tracked machines in the province were highly utilized during the fall period. Even with the tracked machines, fields that were really too poorly drained for corn have received some compaction and smearing. Such smearing and compaction will delay spring cultivation and will take time to correct.

6.4 CEREAL GRAINS

The 1991 growing year was once again a very difficult one for cereals in both growing conditions and price.

Winter cereal plantings in the fall of 1989 were reduced due to lower anticipated price for milling grain. Winter survival was the poorest in a number of years with some areas of the Annapolis Valley experiencing severe winter kill. Disease pressures were low but dry weather from early May to harvest resulted in lower than average grain yields due to poor grain fill. Quality of grain harvested was quite good.

Spring grain planting was completed in good time. The very dry conditions which began in mid-May and continued through August reduced tillering and grain fill period resulting in generally low grain yields. The exception was on heavier soils in the northern part of the province where some excellent yields were harvested. Wet conditions in late August and September made harvest of late seeded grain difficult or impossible.

6.4.1 NOVA SCOTIA GRAIN MARKETING BOARD

The Nova Scotia Grain Marketing Board (NSGMB) is a producer operated Board, which markets winter and spring grain, as well as corn, soybean and canola. The Board takes an active role in producer issues, including industry meetings, research and development activities, crop scouting, as well as marketing.

The continued depressed price for all grain types resulted in continued reduction in the tonnages being offered to the Board. Tonnages of barley have stayed relatively constant while wheat, rye and oat volumes committed to the marketing pools dropped significantly.

The development of a market for soybeans over the last year has been successful and demand now outstrips supply. The Board has been instrumental in developing a market for roasted soybeans and wants to develop

it further.

The Board, for the first time, got involved in hay marketing by offering advance payments similar to grain for delivered forage. The Board, in cooperation with the Grain Commission, investigated canola processing and marketing of canola products. Although a difficult process, there have been some positive developments with regard to canola oil. A small on-farm use market has been developed. Additional work needs to be done in this area.

The reduced volume in the pools has seriously reduced the revenue of the Board, since revenue is based on an administration fee for each tonne marketed. The Board has considered its financial options very carefully and has weighed them against the objectives of the Board. The next year will be a very critical period for the Board.

The Grain and Oilseed Development Fund was established in 1991 to utilize the residual from the 1990 Special Grains Assistance Fund which was administered by the Board. The fund jointly administered by the Board, Grain Commission and Plant Industry Branch will fund programs that will assist in the production and marketing of grain and oilseed crops in Nova Scotia.

6.5 SOYBEANS

The growing conditions during the 1991 season were generally quite favorable for the growth and development of soybeans which resulted in good yields in most cases and excellent maturity. Due to unusually dry weather conditions and the first time use of a new weed control product weed control was less than ideal in 1991.

Most soybeans were harvested with higher than normal moisture due to the very wet fall. Some were harvested after the ground was frozen enough to carry a combine. A small amount was not harvested at all.

There is an increasing interest in soybean production in the province. Markets are developing and there is potential for further utilization of both raw but more so roasted soybeans. It is anticipated that seedings will be increased in 1992.

6.6 TOBACCO

The 1991 growing year proved to be a very good growing year for tobacco. The major part of the crop avoided the effect of the late spring frost. The late arrival of fall frost allowed the crop to reach full maturity. Growers contracted 771,250 lbs. of tobacco from 312 acres at $2.26/lb for a gross of $1,743,635.

Recently, Delgold has been the main variety grown in the province. Variety trials have indicated that the variety TB5-2 may be much better. If this variety does well in commercial production in 1992 it may replace Delgold.

Reductions in production quotas continues to reduce the provincial production of tobacco. Individual growers continue to utilize the Tobacco Redux program to get out of tobacco production. Most tobacco growers no longer rely on the tobacco crop as their only source of income and are incorporating other enterprises into their operations. There is a challenge to find appropriate crop kinds that will grow on soil types that are suitable for tobacco production, as well as generate income levels similar to what tobacco has done in the past.

6.7 SOIL & CROP IMPROVEMENT ASSOCIATION (S.C.I.A.) ACTIVITIES

During the past year, County S.C.I.A. Directors have worked closely with Soil & Crop Specialists and Agricultural Representatives to provide demonstrations and discussion on improved crop management practices. Although Association activities tend to be fairly similar from year to year, experience has proven that these "on farm" crop demonstration trials, crop competition/tours and winter cropping seminars provide the membership with the opportunity to gather on a county or regional basis and take part in valuable information

exchange.

In 1991, there were 31 "on farm" field crop demonstration and research trials of which many were toured. The results were reported in the annual Plant Industry Project Results booklet. Besides the trial work, tours and crop competitions, the Soil and Crop Associations continue to be a valuable vehicle to organize and deliver information meetings. All these programs appeared to be fairly successful in encouraging the improvement in livestock feed yields and quality, as well as promoting sound agronomic practices within the Association's some 750 members.

8.8 LAND MANAGEMENT & ADJUSTMENT PROGRAM (LMAP)

The Canada/NS Land Management Adjustment Program (LMAP) presents a strategy to integrate the efforts and activities of researchers and extension specialists in the Atlantic provinces in their attempts to adopt improved land management practices for agriculture in Nova Scotia.

A Crop and Resource Management Workshop, built on the information and recommendations evolved from the **Crop Rotation and Resource Management Symposium (ALFI HR project)**, was offered February 25–27, 1991, for the purpose of coordinating and conducting investigative studies associated with forage, grain and vegetable production.

The workshop, held October 29-30, 1991, brought farmers, industry, extension and research representatives together to identify issues and to priorize activities. This group of fifty, through formal discussion groups with the assistance of professional facilitator, identified 64 research issues and 52 extension issues.

Grant MacKenzie, Resource Specialist, is working under contract with the staff of the Plant Industry Branch. This position will develop over the life of the Agreement.

The further development of on-farm Land Management Adjustment initiatives will occur as a result of the recommendations of an investigative travel to Pennsylvania and Virginia. This activity will utilize the resources allocated to the on-farm component of this program.

Due to the limited resources in the program, the initiative will focus on representative groups within the farming community to develop management approaches. These "pilot" experiences will then be used as prototypes to hopefully be implemented on a wider basis across the province at a later date under a different program.

Through the use of a resource specialist and on-farm activities, significant progress is expected in improving land management practices in Nova Scotia.

Chapter 7

SOIL SURVEY AND LAND USE

Mike Langman, Provinclai Advisor Land Use Planning

7.1 OVERVIEW

The Land Use Planning Section of the Plant Industry Branch provides expertise and services in soil research, environmental issues, resource management, agricultural climatology, cartography and agricultural land use policy and planning. In addition, the Section participates in agricultural extension programs thereby providing the agricultural industry with information and direction on matters relating to sustainable use and management of Nova Scotia's land and water resources.

The following sections provide details on the activities of the Land Use Planning Section throughout 1991.

7.2 LAND EVALUATION AND PLANNING SERVICE(LEAPS)

7.2.1 PHASE I

The Land Evaluation and Planning Service (LEAPS) program surveyed nine (9) new farms in 1991 totalling approximately 1,038 hectares. These were distributed across the province as follows:

- 2 in Kings County
- 2 in Hants County
- 1 in Halifax County
- 1 in Colchester County
- 1 in Antigonish County
- 1 in Inverness County
- 1 in Cape Breton County

As well, the program conducted four (4) update surveys of new cleared land on farms surveyed in previous years. The update surveys totalled approximately 150 hectares.

Three (3) new farms, totalling approximately 450 hectares, are scheduled to be surveyed by LEAPS in 1992; 1 in Cumberland County, 1 in Kings County and 1 in Guysborough County. In addition ten (10) update surveys totalling approximately 370 hectares are scheduled for 1992.

7.2.2 PHASE II

Phase II, the interpretation and recommendation component of LEAPS, continued its service to client farmers in 1991 with a major shift in the way Phase II of the LEAPS program is delivered. The shift was based on the identification of local department "contacts" to deliver Phase II of the program. These contacts, usually local agricultural representatives or crop specialists, will act as the primary source of farmer contact with the LEAPS management team. This change will result in better service to the LEAPS clients in three ways:

- providing farmers with more frequent and familiar contact with representatives of the program. This is particularly important for farms located at a distance from Truro.
- providing greater involvement of extension staff at the local level in the LEAPS program.
- providing additional developmental time to the LEAPS project team staff to further automate the program, and to design new and improved products.

Seven farms surveyed in 1990 were provided with initial products under Phase II of the program in 1992. These farmers received complete packages of initial Phase II recommendations. As well, all farmers surveyed in previous years who requested updates to their products received them during the course of 1991. Due to the distribution of delivery of Phase II recommendations throughout the Department, it is difficult to provide statistics on the exact number of updates provided.

The LEAPS program has provided farmers with high quality land management tools including field boundary maps and soil maps. In addition, the Service has spawned the development of numerous recommendation and interpretation products based on the resource inventory. These interpretive products have significantly enhanced the consistency, scope and timeliness of recommendations provided to farmers enrolled in the LEAPS program. Furthermore, these advances provide potential spin–off benefit for non–LEAPS farmers within the province.

7.2.3 GIS DEVELOPMENTS

The past year saw significant activity in the GIS service component of the LEAPS program. Highlights of 1991 activities are as follows:

- The new Long Term Record System (LTRS) was established and introduced to clients.
- The computerized Crop Ratings System and Database was developed which provides clients with an automated crop rating.
- The Soil Legend Generator was updated and improved to provide a more meaningful product.
- The Detailed Soil Report Generator program was completed and linked to the GIS. As well, alteration of the format and content of the reports was initiated to create a better product.

It is anticipated that 1992 will see a continued high level of program development in the GIS area. Targets for 1992 include:

- Completion of a Land Improvement Ratings system and Database to parallel the Crop Rating System.
- Development of a detailed Site Database.
- Completion of the Detailed Soil Report format and content change.

A GIS Steering Committee, comprised of section staff, Agriculture Canada staff and a GIS consultant, provided guidance in the implementation of GIS technology within the Department. The Committee met on three occasions in 1991 to coordinate the development of data bases, to assign tasks to Committee members and to assess the progress of the GIS implementation.

7.3 CARTOGRAPHIC LABORATORY

In 1991, the cartographic laboratory completed its first year of operation with ESRI ARC/INFO Geographic Information System computer technology. The GIS hardware includes a VAX 3800 mini-computer linked to three, 19" graphics terminals through an ethernet linkage. Two Tektronix 4211 terminals with Altek digitizing tables perform as data entry work stations, and a Tektronix XN11 terminal is used as a data query and analysis station. Hard copy map products are produced using a Calcomp model 1025, cut-sheet, four colour pen plotter.

The GIS laboratory produced soils maps for the nine farms soil surveyed in 1991. The farms received field maps at a standard scale and a working scale field map. Additionally, air photo mosaics were produced for these farms.

The GIS lab, started the process of converting the orthophoto based LEAPS maps for the years prior to 1990 into digital maps. At the end of 1991 a total of 34 farms had undergone the conversion and had received digital maps. The GIS lab digitized approximately 50 base maps (with the exception of bases for Cumberland County farms which were received from the N.S. Dept. of Natural Resources). In addition, the GIS lab participated in the automation of the process for making crop rating maps for the LEAPS farms. The GIS lab also prepared maps for the soil survey of the Strathlorne Nursery in Cape Breton.

7.4 LAND USE PLANNING

The land use planning component of the Section provides technical expertise on issues of program and policy, land use planning, land information and resource management. In addition, the Section represents the Department of Agriculture and Marketing on interdepartmental, regional and national committees whose mandate it is to review and make recommendations on land use concerns. Similarly, the Section provides technical input to the Department on provincial and national sustainable agriculture and environmental issues such as the Green Plan, the Environmental Impact Assessement process and the Round Table on Environment and the Economy.

7.4.1 NOVA SCOTIA LAND USE POLICY COMMITTEE

The Nova Scotia Land Use Policy Committee (LUPC) is charged with providing advice to cabinet on land use issues. The Working Group of the LUPC has established committees and issue groups to address specific topics of land use policy in Nova Scotia. Section staff represented the Department on six different occasions at meetings of the Working Group to review reports on land use issues submitted by active Issue Groups. A major activity of the Working Group in 1991 was to review and provide input to development of the "Sustainable Development Strategy" under the Nova Scotia Round Table on Environment and Economy.

Section staff represent the interests of the Department on several Issue Groups under the Nova Scotia Land Use Policy Committee structure. These Issue Groups and their functions include:

Water Resources Issue Group

The Water Resources Issue Group met 12 times during 1991. The main function of this Group was the completion of a handbook on water supply watershed management entitled "Designing Strategies for Water Supply Management in Nova Scotia". This handbook will be published early in 1992. On completion of the handbook the Water Resources Issue Group will be disbanded.

Coastal Zone Management Issue Group

The Coastal Zone Management Issue Group was re-established late in 1991, and held one meeting in early December. It's primary mandate is to develop a co-ordinated approach to the management of the coastal sone in Nova Scotia. In 1991 activity of this group focused on development of a workplan to be initiated in 1992.

Abandoned Rail Lines Issue Group

The Abandoned Rail Lines Issue Group was established and given the mandate to develop a strategy to make best use of abandoned rail line corridors in the province. The Issue Group submitted a report to the Working Group on the status of abandoned rail lines and provided a recommended approach to acquiring rail lines. The Issue Group was then disbanded. The Issue Group was subsequently re-struct and given the mandate to review and make recommendations on all existing abandoned rail lines. The Issue Group is currently preparing a .eport to be forwarded to the Working Group in 1992.

Land Information Committee

The Land Information Committee is primarily concerned with establishing and coordinating a provincial land information management system which will respond to present and future land information needs. Over the past year, the committee organized, and sponsored the Geomatics 1991 Conference. The Committee also initiated a "Land Information Standards Study and Data Audit for the Province of Nova Scotia". Section staff participated in a steering committee of the Land Information Standard Study to provide direction and review of the project.

Section staff also represented the Department on two Sub-Committees of the Land Information Committee:

1. The Property Mapping Sub-Committee met twice in 1991 primarily to complete a draft document entitled "Property Records Information Management Policy" to facilitate the completion of conventional property mapping and parcel indexing in the province.
2. The Base Mapping Sub-Committee met nine times over a wide variety of initiatives including ongoing review and priorization of the provincial base mapping program, priorisation of aerial photography requests and the review of base map specifications.

Soil and Water Conservation Issue Group

The Soil and Water Conservation Issue Group, chaired by Section staff, met on nine occasions in 1991. During the year the Issue Group completed a draft background document on soil conservation entitled "Soil Conservation Issues in Nova Scotia". In addition, a subcommittee of the Issue Group submitted a proposal to the National Soil Conservation Progam which proposed to develop a soil education video and school teachers' guide for grades 5 and 6 science classes. The proposal was approved and with technical input and support from the Department of Education the steering commitee began the production of the video and guide. Both products should be available for distribution in the fall of 1992.

The Issue Group with the Department as lead agency also reviewed projects that underwent the Environmental Impact Assessment (EIA) process, in order to ensure that soil resource concerns were considered during project evaluations.

7.5 NATIONAL SOIL CONSERVATION PROGRAM

In April, 1990 the Canada–Nova Scotia Agreement on Soil Conservation was signed providing $1 million over five years for soil resource management and conservation initiatives within Nova Scotia. The Section represents the Department on the two implementation committees under the Program.

- The Soil Conservation Progam Implementation Committee. The Committee met seven times in 1991 to review project proposal submissions under the three federally administered components of the Program. In addition, the Implementation Committee developed and approved activities on soil awareness for National Soil Conservation Awareness Week.
- The Streambank Protection Program Implementation Committee. The Committee met on five occasions to review and approve works under the program, and to develop guidelines for the placement of stream protection structures.

In addition, Section staff assist in the preparation of program updates, annual budgets and reports for both programs for submission to the Management Committee.

7.6 ENVIRONMENTAL SUSTAINABILITY INITIATIVE AGREEMENT

The Environmental Sustainability component of the Special Assistance program was announced on September 27, 1991. Under the Program Canada and Nova Scotia signed an Environmental Sustainability Initiative Agreement (ESI) to facilitate the adoption of effective resource management and environmentally sustainable practices as a key to; increasing long-term financial returns to agri-food sector producers, to sustaining the natural resource base for agriculture and to increase competitiveness of the agri-food sector. Section staff acted as project cordinator to develop a list a nine projects in consultation with specialists within the Branch. The projects highlighted the components of environmental awareness and training, environmental testing and waste disposal.

The projects include:

- Orchard Sprayer Calibration Training
- Pesticide Certification Training
- Environmental Awareness Video
- Pesticide Sprayer Calibration Video
- Environmental Farm Model
- Manure Test Project
- Pesticide Residue Enhancement Project
- Silo Wrap Re-cycling
- Waste Pesticide Disposal

Two projects under the Agreement were developed and implemented by Section staff. These are:

1. **Environmental Sustainability Display Model.** The objective of the project was to construct a portable "environmental farm" model with a back-drop to illustrate conventional farming practices while demonstrating the compatibility of modern farming under the broad theme " Farming Today For Tommorrow". The model will be available for display in March, 1992.
2. **Silo Wrap Re-Cycling Project.** The objective of this project was to initiate a pilot study which would develop ecomomically and environmentally compatible alternatives for disposing of or re-cycling silage wrap. A final report and strategy will be released in 1992.

7.7 LAND MANAGEMENT ASSISTANCE PROGRAM AGREEMENT

The Land Management Assistance Program Agreement (LMAP) was signed in November 1991 to facilitate the adoption of effective resource management and environmentally sustainable farming practices as a key to increasing long-term financial returns to producers of grains and oilseeds and edible horticultural crops, sustainability of the natural resource base for agriculture, and competitiveness of the agri-food sector. Section staff participated in the development and implementation of the Agreement and in the program components identified in the Agreement. In addition, staff provide technical input on a steering committee which oversees the implementation of the program components.

7.8 SUSTAINABLE AGRICULTURE AGREEMENT UNDER THE GREEN PLAN

Section staff developed an Accord with the federal government to facilitate the negotiation of Agreements for sustainable agricultural resource management. A Green Plan Working Group subsequently began development of an Agreement respecting environmental concerns related to agriculture and food production entitled "Canada/Nova Scotia Agreement on the Agriculture Component of the Green Plan". The Committee also developed program components in the areas of education and awareness, resource management and waste management. The programs will be implemented upon signing of the Agreement.

7.9 NOVA SCOTIA SOILS INSTITUTE

On January 26, 1986 the Minister of Agriculture and Marketing, the Honourable Roger Bacon announced the formal authorization of the Nova Scotia Soils Institute together with the appointment of its initial membership. The Institute was established by the Nova Scotia Department of Agriculture and Marketing for the purpose of co-ordinating and conducting investigative studies of soils in the province. The ultimate objective of the Institute is to serve to enhance our understanding of the soil resources of the province, including capabilities and limitations. Increased understanding is believed to be a critical step towards achieving improvements in soil resource management. The Chairman and Secretary of the Institute are appointed from Section staff.

The Nova Scotia Soils Institute continued to be highly active in 1991/92 with the initiation of a number of projects and activities. In particular in 1991/92, the Institute supported two major projects designed to test alternative methods of evaluating agricultural land use and change of use. In addition, the Chairman of the Institute was appointed to the Advisory Board of the Eastern Canada Soil & Water Conservation Center in St. Andre, New Brunswick, to bring provincial soil resource management concerns to the regional Center. Similary, the Chairman became an ex officio member of the Nova Scotia Crop Development Institute to help enhance the coordination of activities between the two Institutes.

The Institute continued its support of ongoing research projects, and reviewed soil and soil related research project proposals for technical merit and relevance to provincial research needs. In addition, the membership was active in the development of projects that will be submitted for funding in 1992/93.

In 1992/93 the Institute will continue its efforts to increase the general understanding of the provincial soil resource and will co-ordinate and initiate needed soil research and awareness projects. Planned activities include:

- The initiation of a Long-Term Soil Test Calibration Program developed under AFDA project TDP-05.
- The initiation of a project to develop the methodology for designing and implimenting on-farm soil conservation planning.
- Hosting an Agro-forestry Workshop.

The Institute will endeavor to develop new avenues for soils related projects that may involve a number of disciplines. As well, the Institute plans to actively seek funding support for project activities through the National Soil Conservation Program and the new Canada/Nova Scotia Sustainable Agriculture Agreement under Canada's Green Plan.

7.9.1 RESEARCH PROJECTS

During 1991/92, the Institute continued its support of projects initiated in previous years and initiated two new projects. Copies of project plans for these and all other projects supported by the Institute, as well as further details on interim results are available upon request by contacting the Chairman, Nova Scotia Soils Institute. Brief descriptions of those projects developed and lead by Section staff follows.

Monitoring Agricultural Landuse — NSCP–SCM03

Project Leaders — M. N. Langman, G. T. Patterson

The objective of this project is to demonstrate an economically viable approach to monitoring agricultural land use through a combination of remote sensed applications and inventories.

A search of available remote sensed information was conducted in 1991, and all available imagery was assessed for its completeness, utility and economic suitability for provincial agricultural land resource monitoring. A land use monitoring procedure was developed based on an agricultural land systems approach, and a pilot study was conducted in the Truro-Maitland-Great Village area.

A 1:50,000 land use systems map of the study area was prepared using a combination of field observations, farmer interviews and remote sensed information.

A final project report and map will be completed by mid summer 1992.

Assessment of Farming Systems — NSCP–SCM02

Project Leader — G. T. Patterson, M. N. Langman

The objective of this project was to evaluate a biophysical basis for reporting Census of Agriculture data. In 1991 a digital file of Statistics Canada 1986 agriculture statistics was recompiled based on Agroecological Resource Areas (ARAs) created from a variety of sources including the Soils Landscape Map of Nova Scotia and the Theme Regions Map of Nova Scotia. Rural Canada Census Enumeration Areas were assigned to the ARAs and a summary of Statistics Canada data was created based on the groupings. Tabular and map products illustrated the benefits of these biophysical based groups over the traditonal ennumeration based groupings for agricultural resource applications.

A final report and map products is in preparation and is scheduled to be completed by mid summer of 1992.

Soil Awareness Video — NSCP SCA02

Project Leader — M. Langman

The objective of this project was to prepare a Soil Conservation Awareness Education Module comprised of a video and a supporting teachers' guide targeted for grade 5 and 6 science curriculum module. The goal of the education module was to provide more resource information on soils, and to increase childrens' understanding and appreciation for soils as an important resource.

A video script was prepared and approved in 1991, and filming of the video has begun. The teachers' guide is in preparation and will be ready for release with the video. Filming will be completed and the video/teachers' guide will be available through the Department of Education Media Services in September, 1992. It is anticipated that copies of the video and guide will be distributed to all elementary school science teachers.

7.10 AGRICULTURAL CLIMATOLOGY

7.10.1 THE GROWING SEASON

The growing season of 1991 will long be remembered as one of extremes and once again the weather was on the forefront of many peoples minds. Although, many seasonal weather related totals were close to normal values, the day-to-day, week-to-week and even the month-to-month variability in the prevailing weather patterns of the region significantly affected many facets of agricultural production.

Heat Unit accumulations throughout the province ranged from slightly below normal in many regions of northern Nova Scotia to as high as 15% above average in the center and western sections of the province. These higher than normal "growing degree-day" totals were somewhat complemented by sunshine totals well in excess of the 30 year average for many regions. If it had not been for the generally overcast conditions throughout a great deal of September, many regions would of experienced record high amounts for the season.

Table 7.1: Temp, Ppn't, Degree-days and Sunshine at Kentville CDA, 1991

Temperatures (°C), Degree-days, Precipitation (mm) and Sunshine (hr)
Canadian Department of Agriculture Experimental Farm
Kentville, Nova Scotia
1991

Temp	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
High °C	8.5	9.0	15.0	20.0	28.0	30.5	34.5	30.5	29.5	23.0	18.5	13.5
Low °C	-21.0	-17.0	-10.0	-6.5	-3.0	5.0	7.5	6.0	3.0	-1.0	-6.0	-15.0
Mean °C	-6.8	-3.7	0.7	5.3	12.2	16.7	20.0	19.8	14. 7	10.7	5.5	-3.1
Degree Days 5°C												
Actual	0.0	0.0	5.5	18.8	223.1	349.9	462.7	456. 7	289.5	179.0	50.7	2.7
Normal	1.0	1.0	5.0	34.0	169.0	326.0	439.0	416.0	278.0	135.0	40.0	7.0
Precipitation												
Actual mm	125.8	43.1	143.9	96.5	128.4	14.8	90.6	166.4	152.6	103.6	172.0	109.0
Normal mm	135.6	106.8	98.6	82.6	77.3	71.2	70.2	98.1	85.5	101.9	119.4	130.3
Bright Sunshine												
Actual hr	81.5	101.7	115.9	188.7	252.9	266.7	258.8	237 .3	161.8	113.8	50.5	51.6
Normal hr	73.2	97.8	128.1	152.1	201.5	217.0	239.3	224.9	174.8	139.3	80.5	55.7

In terms of rainfall throughout the region for the 1991 growing season the word "extreme" can once again be appropriately used to describe the events the took place. Throughout the early weeks of May rainfall amounts were plentiful over most of the region. Then words such as "drought" or "dry spell" became standard practice for describing the latter part of May, June and a great deal of July. Afterwards, rainfall amounts were more than enough to raise the seasonal totals to amounts well above normal.

Antigonish	Ant
Bridgewater	BW
Greenwood	Gr
Halifax	Hfx
Middle Musquodoboit	M.M.
Nappan	Nap
Parrsboro	Par
Sydney	Syd
Truro	Tru
Yarmouth	Yar

7.11 MISCELLANEOUS COMMITTEE ACTIVITIES

Section staff contributed to a wide range of provincial, regional and national committees in 1990. The following is a listing of those committees, and a brief summary of their activities.

7.11.1 ATLANTIC ADVISORY COMMITTEE ON SOIL SURVEY (AACSS)

The Atlantic Advisory Committee on Soil Survey (AACSS) met once in 1991. The primary function of this meeting was to discuss the future of this committee. At this meeting it was agreed that AACSS would approach its parent committee, the Atlantic Committee on Soil and Climate for a revised mandate or possible merger with the Atlantic Advisory Committee on Soil Resource Management.

Table 7.2: Temp, Degree-days, Ppn't, Sunshine for Nappan

Temperatures (°C), Degree-days, Precipitation (mm) and Sunshine (hr)
Canadian Department of Agriculture Experimental Farm
Nappan, Nova Scotia
1991

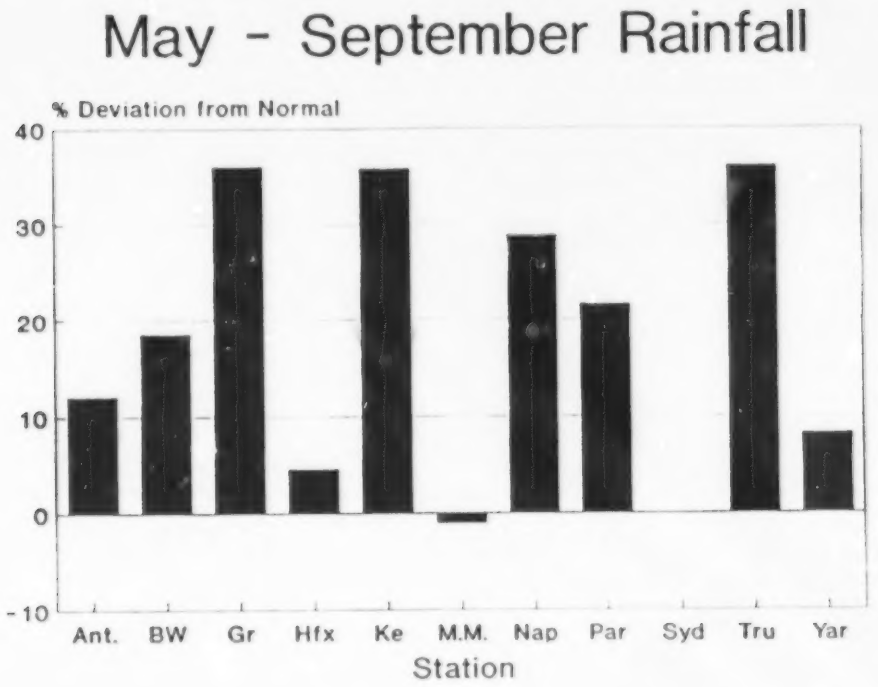
Temp	JAN	FEB	MAR	APR	MAY	JUN	JUE	AUG	SEP	OCT	NOV	DEC
High °C	5.5	8.0	11.0	18.5	26.0	28.5	30.5	29.5	24.5	22.0	16.0	11.0
Low °C	-26.5	-25.0	-14.0	-8.5	-5.0	1.5	4.0	2.0	2.5	-2.0	-7.0	-20.0
Mean °C	-9.8	-5.8	-0.5	3.4	10.5	14.8	18.4	18.4	13. 1	9.8	4.0	-5.2
Degree Days 5°C												
Actual	0.0	0.0	1.0	25.8	174.7	292.4	415.5	413.4	185.6	151.2	35.7	3.5
Normal	0	1.0	3.0	21.0	136.0	290.0	402.0	384.0	251.0	116.0	32.0	5.0
Precipitation												
Actual mm	119.1	35.5	144.9	78.3	90.7	49.5	57.1	198	126.9	99.0	149.1	99.2
Normal mm	113.9	88.9	89.8	75.3	7. 9	78.3	84.4	91.1	81.2	101.4	108.0	51.4
Bright Sunshine												
Actual hr	101.5	116.8	125.0	192.7	232.2	266.6	266.0	210.6	89.0	105.6	58.0	64.0
Normal hr	89.2	109.6	125.8	149.3	193.6	209.3	231.8	212.8	162.5	131.1	83.6	74.3

Table 7.3: Temp, Degree-days, Ppn't, Sunshine for Truro

Temperatures (°C), Degree-days, Precipitation (mm) and Sunshine (hr)
Nova Scotia Agricultural College
Truro, Nova Scotia
1991

Temp.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
High °C	7.5	10.5	11.5	19.0	25.7	29.5	33.5	29.0	27.0	22.0	18.0	12.5
Low °C	-25.5	-21.0	-11.0	-10.0	-5.5	2.0	4.5	3.5	1.0	-2 .0	-4.0	-14.0
Mean °C	-8.3	-5.4	0.5	4.1	10.1	15.0	18.7	18.3	13.7	10.2	5.6	-3.6
Degree Days 5°C												
Actual	0.0	0.5	2.5	34.9	164.1	299.2	424.8	412.5	259.2	166.2	55.5	1.2
Normal	1.0	1.0	4.0	17.0	123.5	274.2	399.8	377.2	239.4	106.4	33.0	5.8
Precipitation												
Actual mm	134.7	55.0	118.1	55.2	74.2	64.0	71.2	146.1	202.8	128.0	144.7	147.6
Normal mm	106.0	89.1	91.5	79.9	87.8	60.0	91.5	96.1	75.8	110.3	116.4	133.7
Bright Sunshine												
Actual hr	85.2	97.1	89.7	171.3	225.7	238.9	243.0	199.8	117.5	96.2	43.7	48.2
Normal hr	87.7	107.9	126.2	149.9	196.1	218.1	224.4	212.2	154.5	128.4	84.2	69.7

Figure 7.1: Growing Season Information 1



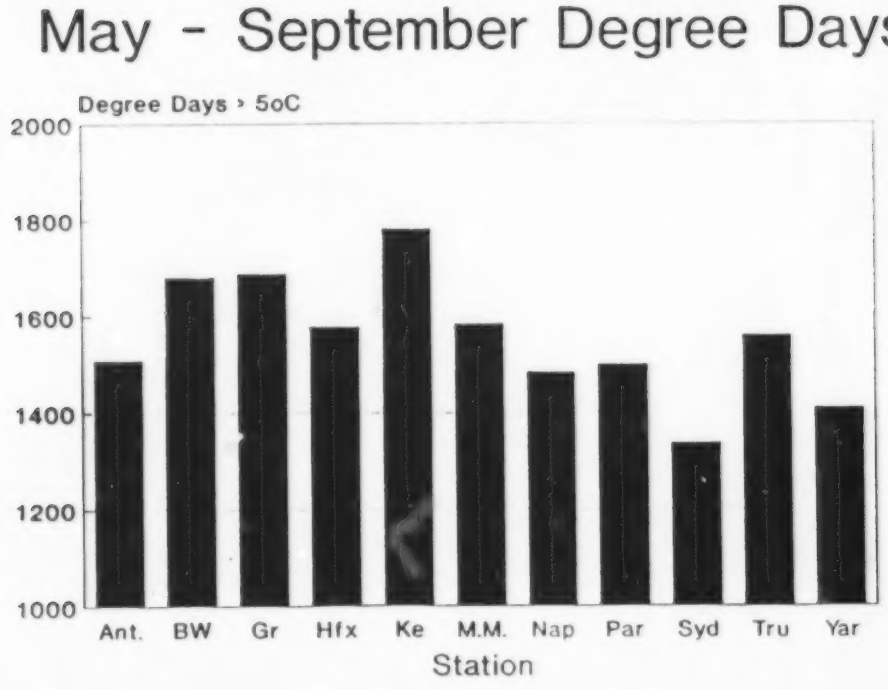
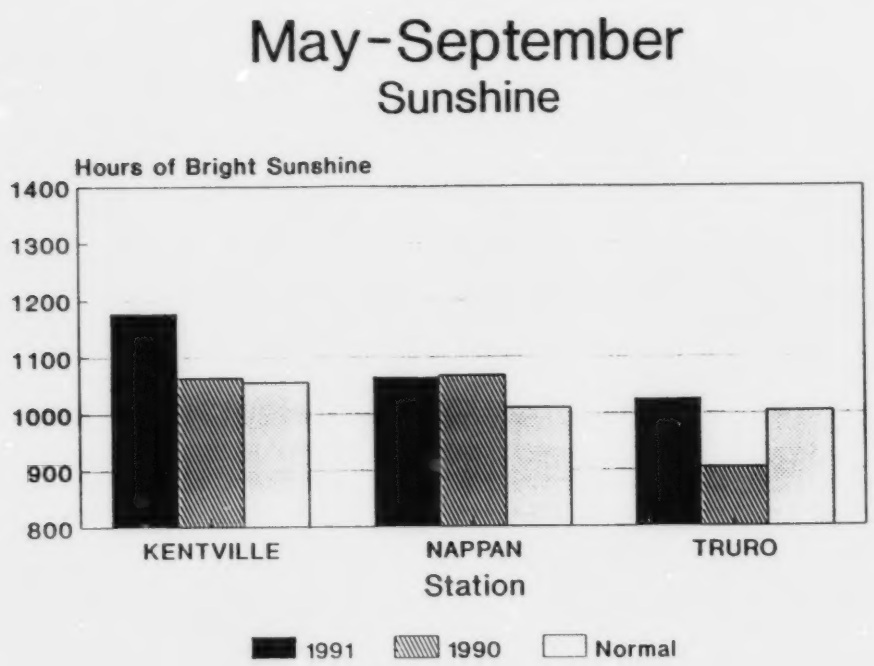


Figure 7.2: Growing Season Information 2



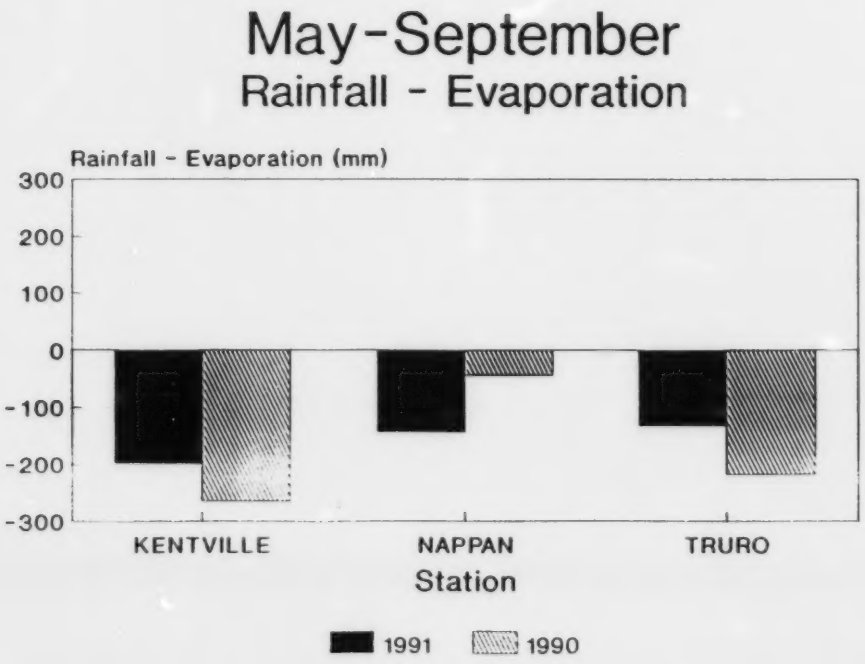
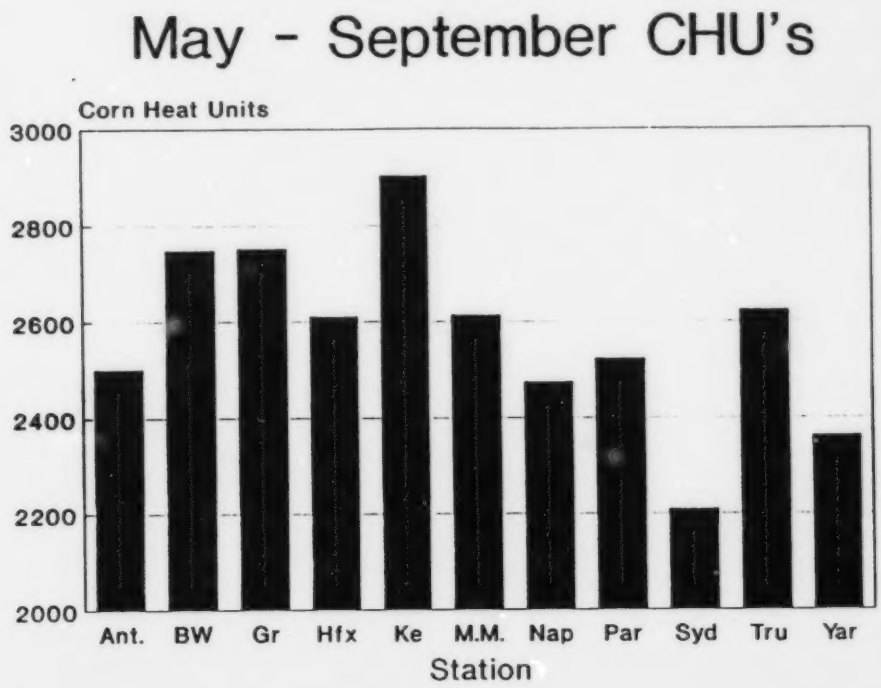


Figure 7.3: Growing Season Information 3



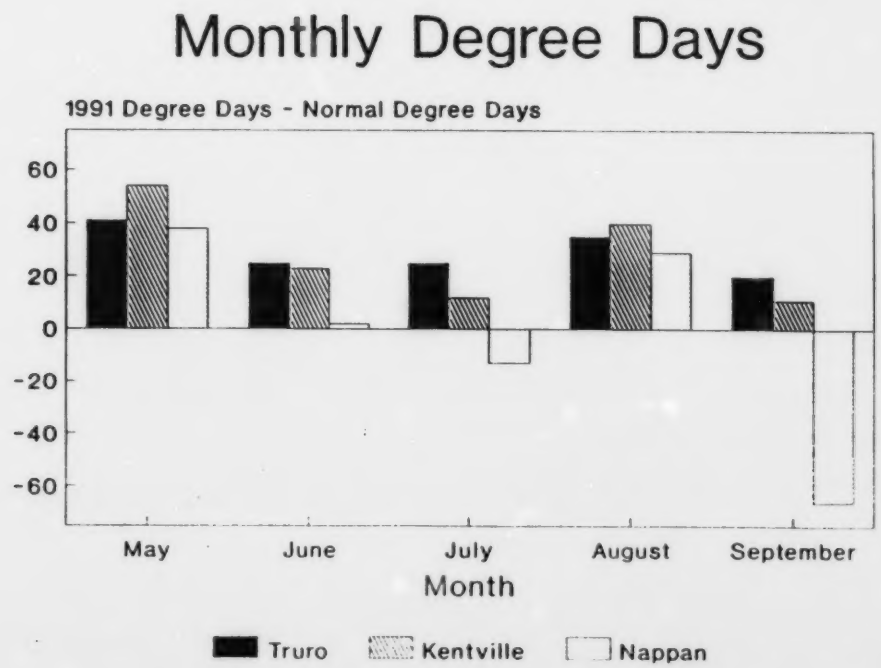
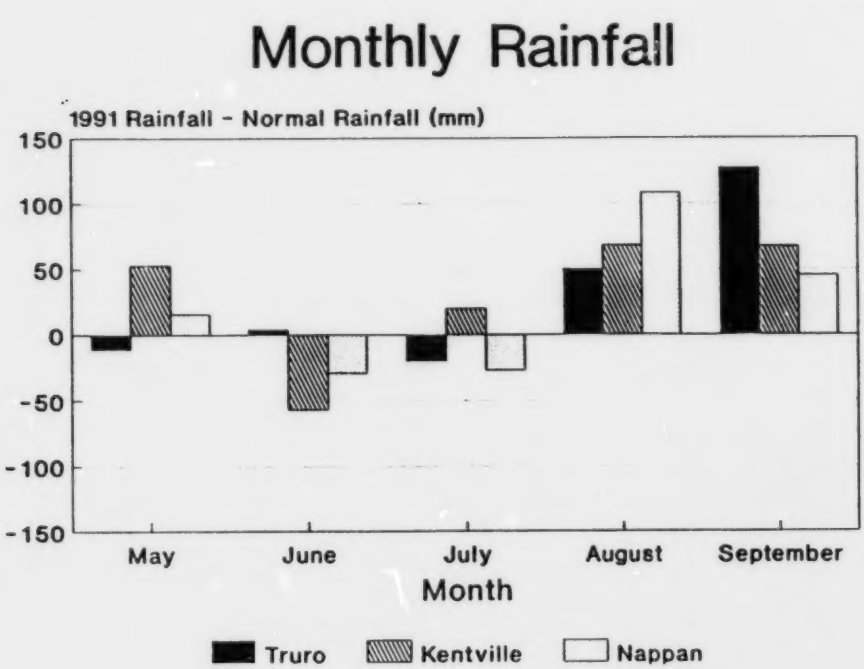
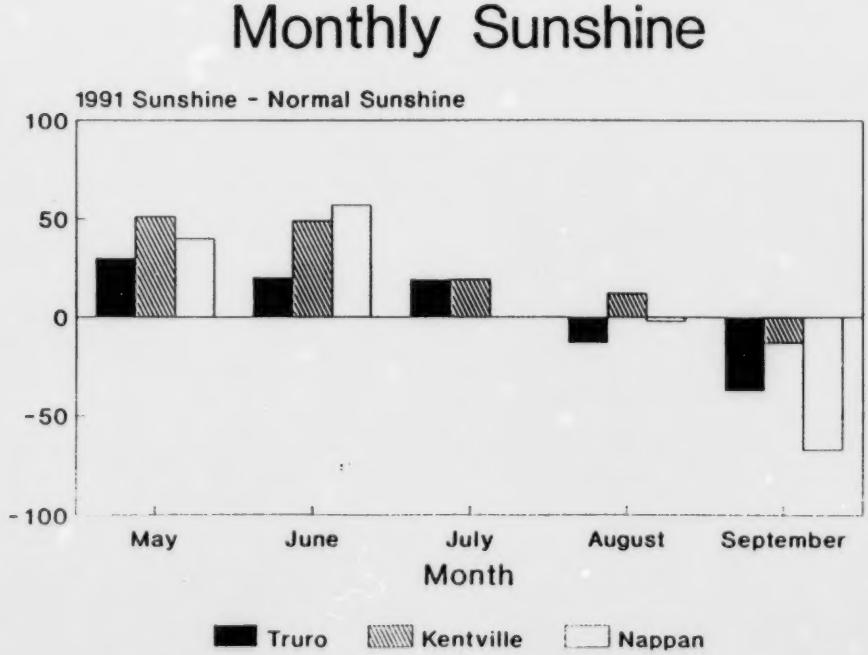


Figure 7.4: Growing Season Information 4





7.11.2 MISCELLANEOUS WATER RELATED COMMITTEES

1. Forbes Lake Watershed Advisory Committee. The Forbes Lake Watershed Advisory Committee is an ad-hoc committee made up of representatives of 4 provincial agencies (Agriculture and Marketing, Environment, Health and Municipal Affairs) for the purpose of guiding the Town of New Glasgow through the process of developing a watershed managemnt plan for the Forbes Lake Watershed. This committee met once in early 1991, but has since been inactive.

2. Aquaculture Network. The Aquaculture Network is a group of representatives from all Provincial and Federal Departments which review applications for aquaculture licences. This committee met once in late 1991 to set up a new approval system to speed review and processing of aquaculture licences.

3. N.S. Pesticides in Groundwater Steering Committee. The N.S. Pesticides in Groundwater Steering Committee is a committee 4 provicial agencies involved in groundwater studies in Nova Scotia (Agriculture and Marketing, Environment, Health and Municipal Affairs). This group co-ordinates studies of this type in co-operation with a parallel Federal committee. This group met twice in 1991. Its primary activities during 1991 were to steer the N.S. Farm Well Water Quality Assurance Study and the development of a Groundwater Sensitivity Mapping Project (draft project outline). This committee has two sub-committees, one for each of the two main projects. The Wellwater Study Sub-committee met 3 times during 1991 while the Sensitivity Mapping Project Design Team met once.

7.11.3 AGRICULTURE AWARENESS COMMITTEE

Section staff attended five meetings of the Agriculture Awareness Committee or sub-committees to assist in the development of a Soil Kit for elementary school children. At years end a draft outline of the Soil Kit was completed which included a Teachers' Guide, activity list, resource contacts and kit contents. Two prototypes of the kit will be completed and distributed to selected teachers in the province for their review and comment.

7.11.4 AD HOC COMMITTEE ON MUNICIPAL WASTE COMPOSTING

An Ad Hoc Committee with representation from provincial Departments of Health, Environment and Agriculture and Marketing met on five occasions in 1991 to develop draft guidelines for composting waste. The Guidelines entitled "Composting Guidelines: Nova Scotia Department of the Environment" cover such issues as classification and uses of compost, facility criteria, testing compost and record keeping. Guidelines were developed and submitted in 1991 to the Department of Environment for comment and approval.

7.11.5 PRINCIPLES' COMMITTEE ON SUSTAINABLE AGRICULTURE

The Principles' Committee was established to address issues of education and research related to sustainable agriculture; to discuss policy and make recommendations to the Deputy Minister; and to keep an Atlantic view of sustainable agriculture. Staff attended one meeting of the Sustainable Agriculture Committee in 1991 to review sustainable agriculture initiatives in the Atlantic and to develop a strategy for implementing the Committees' terms of reference.

7.11.6 EASTERN CANADA SOIL & WATER CONSERVATION CENTER DIRECTORS BOARD

The Eastern Canada Soil & Water Conservation Center was established in 1991 as a resource and information focus for soil resource conservation issues in the Atlantic Provinces. The Board met on three occasions to discuss the role and activities of the Center; the terms of reference; to approve an operating budget and to interview perspective staff.

7.12 CONFERENCES AND WORKSHOPS

The following is a listing of the conferences and workshops attended by section staff in 1991.

- GIS' 91 Conference, Ottawa, Ont.
- Sustainable Agriculture Symposium, Truro, N.S.
- Agriculture Institute of Canada, Annual Meeting, Fredriction, N.B.
- Geomatics Assoc. of Nova Scotia, Workshop, Halifax, N.S.

7.13 EXTENSION ACTIVITIES

Section staff contributed to a diverse selection of extension activities over the past year. The following is a brief summary of those extension activities:

7.13.1 GROUP FUNCTIONS

1. Farmer Meetings: 6
   - Strawberry Growers Assoc. Annual Meeting - made presentation on importance of soil resource and methods for its protection
   - Maryland Farmers Tour - presented history of development and land use in Nova Scotia
   - International Polish Farmers - made presentation on genral farm development and land use patterns
   - Kings Cty. Federation of Agriculture - gave a presentation entitled "Manure Management"
   - Yarmouth County Federation of Agriculture - made presentation entitled "Introduction to Soils"
   - Grape Growers' Annual Meeting - made presentation on the 1991 growing season
2. Tours: 2
   - "Evaluation of Soils for Land Clearing" tour
   - Grape Growers Annual Tour
3. Short Courses: 4
   - Extension Staff Soils Short Course (Truro) -organized course and gave presentations
   - Dept. of Health Soils Short Course (NSDAM) - organized and gave presentations
   - Weed Management Short Course - gave presentation entitled "Environmental Fate of Herbicides"
   - Yarmouth County Federation of Agriculture Soils Short Course - gave one-day course to area farmers on "Interpretation of Soil Properties and Landscape Characteristics for Agricultural Uses"
4. Conferences and Professional Meetings: 18
   - International Environmental Management Seminar (Truro) - made presentation entitled "LEAPS: A Case Study in Environmental Resource Management"
   - NSCP SQEP Advisory Committee Meeting (Ottawa) - presentation on 'N.S. Farm Wellwater Quality Assurance Study"
   - Crop Development Institute, Crop Rotation Workshop (Kentville) - "National Soil Conservation Program" and "Soil Resource Planning" and "N.S. Farm Well Water Quality Assurance Study".

- Animal Science Manure Management Symposium (Truro) - made presentation on manure management issues in the province.
- Nova Scotia Environment Workshop (Cambridge) - gave a presentation on environmental impact of manure use and chaired a round-table discussion.
- National Land Use Planning Committee Annual Meeting (Liscombe) - gave a presentation on the importance of land use planning and mapping for agriculture resource planning.
- Sustainable Agriculture Symposium (Truro) - attended.
- Animal Manure Management Symposium (Ottawa) - attended.
- Agriculture Institute of Canada Annual Meeting (Fredricton) - attended and Chaired session of CSAM.
- Geomatics Association of Nova Scotia Planning Workshop (Halifax)- attended.
- NSAC Chemistry-Soils class 345 lecture on "Soil Compaction"
- NSAC Plant Science class lecture on soil survey and a demonstration of GIS technology applications in agriculture.
- ARC/INFO Users' Conference (Toronto) - participated in the poster session and attended workshop.
- Technical University of Nova Scotia, Center for Water Resources Research - gave seminar on soil water modelling.
- Symposium/Workshop on Changing Climate in Relation to Sustainable Agriculture (Fredricton) - facilitator of session.
- NSAC Plant Science 415 - lecture on water potential for plant growth.
- Sympsoium on the Climate of Nova Scotia (Bedford) - participated in organization of meetings.

5. Demonstration Projects: 4

- LUPC Working Group tour of GIS facility, land use projects and LEAPS products.
- GIS demonstration for NSAC "Open House".
- Organized and participated in a Department display at the "Go Green Environment Fair".
- Atlantic Winter Fair, Agricultural Awareness Days, display entitled "Soils They Are Not Just Dirt".
- Go Green Environment Fair, display entitled "Agriculture and the Environment"

7.14 RESEARCH PROJECTS PARTICIPATION

Section staff conducted a number of applied and pure research projects on climate, soil, water and integrated investigations for agricultural applications.

- Silo Wrap Re-cycling
- Assessment of Selected Remote Sensing Information for Monitoring Agricultural Land Use in Nova Scotia
- Assessment of Farming Systems in Nova Scotia Using Agricultural Resource Areas and Statistics Canada Data
- Temperature Inversion Measurement
- Erosion Risk Potential
- Automatic Weather Station for Grape Growers

- Automatic Weather Station for Department Use
- Irrigation Scheduling
- Wind Fans For Frost Protection
- Recent Trends in the Length of the Growing Season
- Climatic Variability and Potato Production
- Nova Scotia Well Water Quality Assurance Study
- Kings County Well Water Time Study
- Evaluation of Subsoiling on Forage and Cereal Grains
- Effect of Rolling on Soil Compaction and Blueberry Yields
- Subsurface Drainage Performances on a Shallow Slowly Permeable Nova Scotia Soil
- Educational Packages Inventory (in preparation)

Chapter 8

PROVINCIAL LABORATORY SERVICES SECTION

8.1 OVERVIEW

Total sample receipts during 1991 were almost identical with 1990, although some catagories increased significantly while others declined. Average in lab times were held at a level consistent with previous years; soils at 7.8 days, feeds at 5.3 days, tissue at 3.9 days and waters at 4 days.

One major piece of analytical equipment was added during the year with the acquisition of a new gas chromatograph with NP and Hall detectors.

One technical position was lost during 1991 after the resignation of Linda Tingley in September. Otherwise, staff of the Analytical Services Section remained unchanged.

Statistical summaries of samples received during 1991 appear in Table 8.1 through Table 8.9.

8.1.1 SOIL CHEMISTRY

Soil samples showed a modest increase in 1991 and were consistent with the previous 3 to 5 year average, with the exception of 1989. Greenhouse soils remained relatively stable in 1991 with virtually all samples coming from the agricultural sector.

8.1.2 SOIL PHYSICS

Samples requiring soil physical analyses increases only slighly during 1991. Approximately 50% of total determinations were conducted in support of the Land Evaluation and Planning Service.

An additional 36% of analyses were conducted as a result of research projects and about 14% were miscellaneous samples.

8.1.3 LIVESTOCK FEED

Livestock feed samples decreased for the first time in years, dropping by 18% to the lowest level in 5 years. The decrease was mostly accounted for by the decrease in forage samples, perhaps attributable to the poor cropping conditions in 1991. There was a slight drop in the number of research samples.

Foliar tissue samples on the other hand showed dramatic increases both in samples from the Industry and from research projects, increasing a total of almost 60%.

Water samples declined slightly in 1991(about 5%). However, samples from domestic sources continue to increase, up 19% in the last year and 114% over the last 5 years.

Table 8.1: 5 Year Laboratory Sample Summary

MATERIAL	1987	1988	1989	1990	1991	% CHANGE
Soils						
Field	13,096	11,996	14,656	12,368	12,880	
Greenhouse	2,938	1,951	1,494	914	1,027	
Total	16,034	13,947	16,150	13,282	13,907	4.7%
FEED						
Forage	5,968	6,529	7,508	8,213	6,696	
Cereal	1,596	675	887	879	355	
Milled Feed	1,881	2,056	1,621	1,401	1,218	
Other	1,039	1,054	986	1,073	1,223	
Total	10,484	10,314	11,002	11,566	9,492	-17.9%
TISSUE						
Commercial	2,850	2,491	2,370	2,372	2,608	
Research	1,045	555	853	323	1,701	
Total	3,895	3,046	3,223	2,695	4,309	59.9%
WATER	3,199	2,783	3,363	3,600	3,435	-4.6%
MISC.	951	321	251	281	268	
TOTAL	34,563	30,411	33,989	31,424	31,411	-.04%

8.1.4 PESTICIDE RESIDUE

Samples were consistent with 1990 levels, with the largest group coming from the Kings Co. Well Water Survey, with a total of 69 samples. Most of the soil samples analysed were related to crop damage on strawberries and blueberries, with one significantly high atrazine level being found during analyses for phenoxyacids, triazines, Velpar and Sinbar. Anilazine residues on high bush blueberries were found to be well within tolerance. Dimethoate was confirmed in one sample of blueberry but at a level much lower than originally found at point of U.S entry.

Nine of twelve milk samples were found to contain up to 0.07ppm DDT.

Prometryn and carbofuran were checked on carrots because of concern about acceptibility to U.S markets; no residue was detected.

Only eight samples were analyzed for mycotoxins during 1990. One sample of barley and one sample of soybeans contained levels approaching 0.5ppm.

Table 8.2: 5 Year Feed Sample Summary

MATERIAL	1987	1988	1989	1990	1991
Forage					
Hay	1,237	1,563	2,302	2,355	1,539
Haylage	1,695	2,452	2,662	3,502	3,089
Forage	3,036	2,514	2,544	2,356	2,068
Total	5,968	6,529	7,508	8,213	6,696
Cereal	1,596	675	887	879	355
Milled Feed	1,881	2,056	1,621	1,401	1,218
Other					
Canada Packers	597	741	735	835	921
Mink & Fox	396	273	158	86	92
Misc.	46	40	93	152	210
Total	1,039	1,054	986	1,073	1,223
Total	10,484	10,314	11,002	11,556	9,492

Table 8.3: Feed Research Projects

MATERIAL	1987	1988	1989	1990	1991
Forage					
Plant Industry	311	578	907	982	998
Plant Science	505	73	254	295	0
Animal Science	0	99	26	20	42
Other	878	30	0	0	71
Total	1,694	780	1,187	1,297	1,111
Grain					
Plant Industry	426	400	528	608	0
Other	631	—	—	—	0
Total	2,751	1,180	1,769	1905	0

N.B. Feed research samples are included in totals in 5 year summary

Table 8.4: Plant Tissue Sample Summary

MATERIAL	1987	1988	1989	1990	1991
Greenhouse Tissue	1,858	1,620	1,563	1324	1922
Hydroponic Sol'n	232	214	155	154	341
Animal Tissue	185	190	98	250	320
Seaweed Extract	575	467	466	608	25
Research Samples	1,045	555	941	359	1701
Total	3,895	3,046	3,223	2695	4309

Table 8.5: Tissue Research Projects

SOURCE	1987	1988	1989	1990	1991
Animal Science (NSAC)	681	—	0	0	608
Chem.–Soils (NSAC)	276	441	727	186	692
Plant Science (NSAC)	0	0	0	0	0
Other	88	114	214	173	401
Total	1,045	555	941	359	1701

Table 8.6: Water Sample Summary

Source	1987	1988	1989	1990	1991
N.S. Dept. of Tran.	1,805	1,107	1,093	1341	915
N.S. Dept. of Envir.	28	52	87	26	33
N.S. Dept. of Health	14	40	71	25	68
Agricultural Supplies	235	261	513	123	117
Municipal	48	64	26	12	4
Industrial		209	248	149	11
Domestic	1,069	1,050	1,325	1,924	2287
Total	3,199	2,783	3,363	3,600	3435

Table 8.7: Greenhouse Soil Summary

SOURCE	1987	1988	1989	1990	1991
N.S. Dept. Lands & Forests	1,992	851	604	143	8
Agricultural Services	946	1,100	890	771	1019
Total	2,938	1,951	1,494	914	1027

Table 8.8: Soil Physics Lab

	1987	1988	1989	1990	1991
Particle Size	523	834	765	238	430
pH	1,046	1,434	1,264	432	448
Bulk Density	224	661	529	399	344
Hydraulic Conductivity	224	412	146	39	91
Organic Carbon	152	251	239	174	117
Cation Exchange Capacity	28	85	49	23	11
Moisture Retention	161	341	231	26	77
Moisture		64	383	118	136
Total	2,358	4,122	3,606	1,449	1654

Table 8.9: Pesticide Analysis

Samples Received January 1 To December 31, 1991

MATERIAL	NB	NS	PEI	NF	NS DEPTS	OTHER	TOTAL 1991	TOTAL 1990
Soil		19					19	12
Water	2				71	3	76	73
Plant Material	1	16					17	21
Milk	12						12	10
Vomitoxin		8					8	16
Other		11					11	5
TOTAL (1991)	15	54	0		71	3	143	
Total 1990	10	35	2	7	64	19		137